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ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding
that they are contributed exclusively to THE LARYNGOSCOPE.)

SEEING SOUND.*

The Study of Speech and the Accurate Grafing of Speech Vibration.

DR. MAX A. GOLDSTEIN, St. Louis.

Two thousand years ago, the Hindus sensed the value of perfection in speech; it is chronicled in the Hindu books of the Veda that they regarded perfect phonetics in the expression of their prayers and religious thoughts almost as a sacred duty, considered defective expression of language as a profanation and laid great stress on the form, quality and intonation of speech.

The Greeks and Romans in their Forum considered oratory and declamation as one of the essentials of culture.

The Hebrews and other Semitic nations chanted their prayers and devotionals in minor keys with much resonance and artistry. In the later history of the development of the church great care was exercised in hymnal and orison, and even today, the ritual of many religions includes one of its most beautiful services,—the cantations in song and speech to the accompaniment of organ and choir.

Some of these early ideals of perfect phonation are still observed in the expression of spoken language. The modern phonetist, however, with the numerous devices at his disposal for analyzing composite speech sounds, has reduced his analyses to a meticulous science. Today, we are in command of instruments and devices that make this careful phonetic analysis an independent science completing an important contribution to its future development.

*Read before the American Otological Society, New York, May 20, 1927.

Orig. du Langage 6: Pl. II.

ALPHABET HIÉROGLYPHIQUE ET PRIMITIF DE XVI. LETTRES

Lettre	Ses parties. Objets les desquels elle se compose	Caractères ou Correspondances	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents
A	HAUTEUR d'un p ^{er} de	λ	λ	λ	λ	λ	λ	λ	λ	λ
a	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
H	ORANGE d'un p ^{er} de	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
E	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
I	HAUTEUR d'un p ^{er} de	λ	λ	λ	λ	λ	λ	λ	λ	λ
O	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
OU	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
P	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
B	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
M	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

Orig. du Langage 6: Pl. II.

M. Court de Gebelin—Plate I.

Orig. du Langage 6: Pl. I.

ALPHABET HIÉROGLYPHIQUE ET PRIMITIF DE XVI. LETTRES

PLANCHES II.

Lettre	Ses parties. Objets les desquels elle se compose	Caractères ou Correspondances	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents	Alphabets différents
N	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
G	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
C	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
Q	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
S	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
T	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
T	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
D	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
R	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
L	BOUCHE	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

Orig. du Langage 6: Pl. I.

M. Court de Gebelin—Plate II.
"Origin du Language et de L'Ecriture," Paris, 1775.

Recorded speech from the time of the introduction of papyrus and the stylus to the present day of the perfection of the printing press has been expressed by symbols. These symbols take their origin from the form of familiar objects, or the shape of the organs of articulation in their varied positions. We are now making attempts

ALPHABETI

verè Naturalis

HEBRAICI

BREVISSIMA

DELINEATIO.

pro Ebrae Quae simul Di-Historea

Methodum suppedi-

rat, juxta quam qui surdi na-

ti sunt sic informari possunt, ut

non alios saltem loquentes in-

telligant, sed & ipsi ad

sermonis usum per-

Convenire veniant. *Tololani*

In lucem edita

ordin. H. à p. d. i. a

F. M. B. ab Helmont.

SULZBACH,

Typis Abrahami Lichtenthàler.

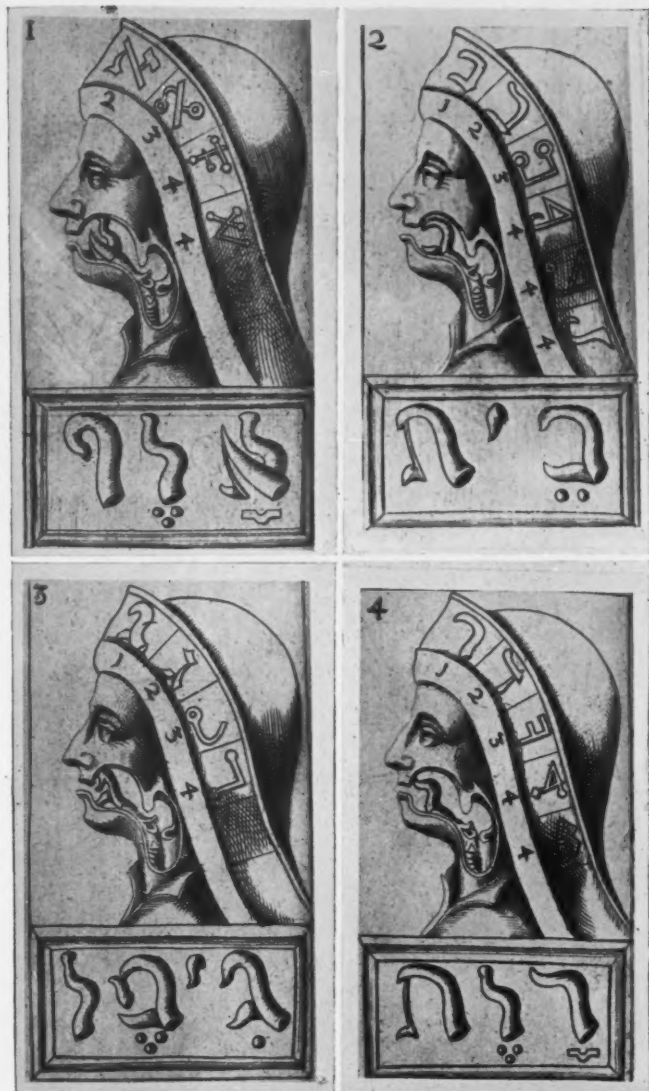
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to record the phonetics of speech by the actual grafts of waves of motion, as created in the production of voice.

F. M. B. Ab. Helmont, in 1667, in a curious presentation attempts to prove that the origin of the natural alphabet of spoken language was based on the formation of the letters of the Hebrew alphabet and the conformation of these letters in relation to the organs of articulation (the tongue, lips, teeth, epiglottis, etc.).

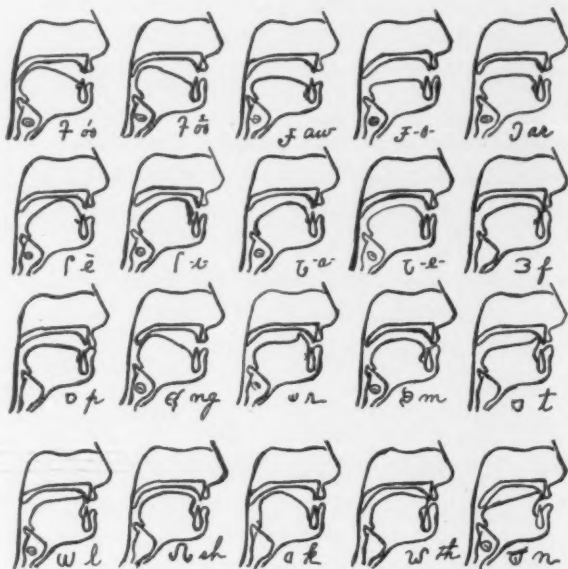


Engraved Frontispiece in Helmont's book showing the author measuring the Organs of Speech with Calipers.



Letters of the Hebrew Alphabet, their shape conforming to the positions of the Articulation Mechanism.

Modern phonetists point with pride to the monumental work of our own American experts, T. Melville Bell, and his son, Alexander Graham Bell, in the production and recognition of a system of visible speech familiar to every progressive teacher of the deaf.



Bell's Visible Speech—Diagrams and Symbols.

This system also was expressed in specially-constructed symbols in type and script and lays down in fixed form the principles of articulate speech, the position of every accessory mechanism in its production and a plan for recording speech in its most complicated variations. There is a striking similarity between Bell's system of visible speech and that of Rambaud presented over one hundred years previously.

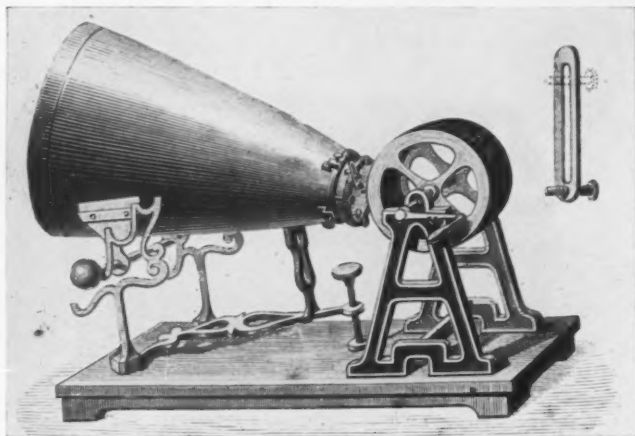
A. J. ELLIS'S ESTIMATE OF VISIBLE SPEECH.

Alexander John Ellis, the chief phonetician of the nineteenth century, has left on record his estimate of Visible Speech. After witnessing a demonstration, by means of tests of his own devising, Mr. Ellis wrote:—*

"The mode of procedure was as follows: Mr. Bell sent his two sons, who were to read the writing, out of the room,—it is interesting to know that the elder, who read all the words in this case, had only had five weeks' instruction in the use of the alphabet—and I dictated slowly and distinctly the sounds which I wished to be written. These consisted of a few words in Latin, pronounced first as at Eton, then as

* Letter to *The Reader*, September 3, 1864.

An important evolution in the study of phonetics was made possible by the invention of the phone autograph (1856) of Leon Scott, of Paris. By the use of this device "speech vibration" or the vibration of the voice was recorded as a "speech-curve" or "Speech-graf". The

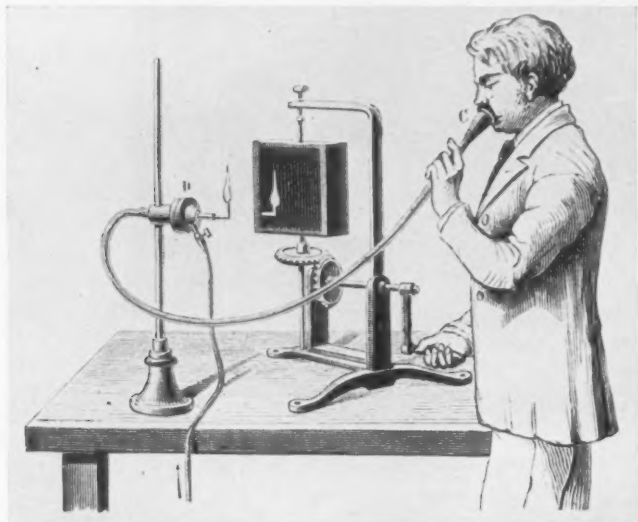


Leon Scott's Phone Autograph.

Scott phone autograph consisted of a large, funnel-shaped mouth-piece leading to a thin elastic membrane equipped with a light lever, the tip of which was placed in contact with a revolving cylinder carrying a smoke-coated, glazed paper roll. The grafs were inscribed on the smoked paper and preserved by a fixative. Modifications and improvements in the Scott phone autograph, by various investigators, followed in quick succession.

Among these special mention must be made of the manometric flame, or manometric capsule, of Rudolf Koenig, of Paris, one of the most profound experts of the century on acoustics.

"The feature of the Koenig Manometric Capsule consists of a cavity which is divided into two parts by means of a thin elastic diaphragm. A speaking tube communicates with the chamber on one side of the diaphragm and gas-tubing with the chamber on the other. Leading from this chamber is a gas burner with a fine vertical orifice.



Rudolf Koenig's Manometric Capsule, Gas Burner and Revolving Mirrors.

A current of gas is turned on and lighted at the burner; the result is a fine jet of flame forming a sort of pencil of light. When, now, a sound is uttered into the mouth-piece of the speaking-tube, the air vibrations are transmitted through the agency of the membrane to the gas in the chamber beyond and the gas-flame is thereby caused to vibrate up and down. When the air condensation reaches the membrane compression of the gas results, the velocity of the out-flow

is increased and the flame becomes taller; and conversely, a rarefaction of gas causes the flame to become shorter. The length of the flame is dependent upon the pressure of the confined gas so that the flame varies in length as the gas varies in pressure.

"When a sound is uttered into the mouth-piece of the speaking-tube, the flame vibrates up and down with great rapidity and the variations in the length of the flame correspond to the variations in the density of the air during the production of sound. The flame, however, vibrates with such rapidity that the eye cannot follow its movements. In order to enable the eye to study the character of the changes that take place in the height of the flame, a mirror is employed, and we view the reflection of the flame instead of the flame itself. For convenience, four mirrors are employed. These are arranged on the vertical sides of a cubicle support capable of rotating about a vertical axis. When the mirror-support is caused to revolve with great rapidity, the reflection of the stationary flame appears like a long band or ribbon of blue light. But when we speak into the apparatus, an undulatory band of light makes its appearance in the mirror. The upper edge of the luminous band appears to be carved into beautiful waves of various shapes and sizes, and when we send different vowel sounds into the mouth-piece of the instrument, retaining the voice on a uniform level, the form or shape of the undulations, visible in the mirror, changes with every vowel. I thought that if I could discover the shape or form of vibration that was characteristic of the elements of the English language, I could depict these upon paper, by photographic or other means, for the information of my Deaf pupils."

"Suppose, for example, that I could present to a pupil a photograph of the undulations produced by uttering into the instrument 'ee'. I could then get the Deaf child to make sounds into the mouth-piece of the manometric capsule, and observe the forms of the flame undulations thereby produced. He could experiment in this way until he could produce an undulation of similar form. He would then know that he was sounding the vowel 'ee'.

"I believed that the instrument might become of great value in teaching articulation to the Deaf, and I therefore made a careful study of the apparatus and its mode of operation * * *.

"I also found that the flame was most sensitive to sound vibrations when the sound was lowered to such an extent that the whole of the flame was blue. Under such circumstances, very beautiful and characteristically-shaped undulations appeared in the mirror when a person spoke softly into the mouth-piece of the instrument. The appear-

ance, however, was so faint that I saw it was hopeless to attempt to photograph it for the information of my Deaf Pupils and I therefore sought to utilize the other form of apparatus to which attention has been directed. I allude to the phone autograph of Leon Scott."

The above graphic description of the use of the manometric capsule as an agency in the production of speech and the training of the Deaf Child is quoted from Alexander Graham Bell.

Equipped with these two devices, namely, the phone autograph of Scott, and the manometric capsule of Koenig, Bell proceeded with his research and study of speech grafs.

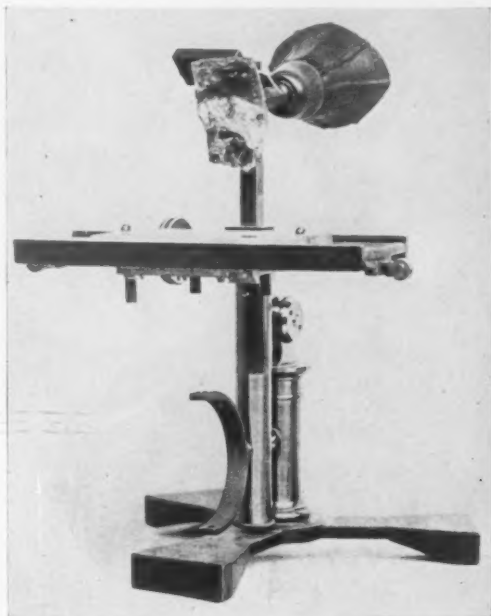
These experiments were conducted early in 1874. Bell again writes: "I was so much interested in the possible utilization of the manometric capsule and phone autograph in the work of teaching speech to the Deaf, that while in the midst of experiments on the phone autograph, I gave a public address upon the subject before the Second Convention of Articulation Teachers of the Deaf and Dumb, which met in Worcester, Mass., on Saturday, the thirteenth day of June, 1874."

The following quotation is taken from the American Annals of the Deaf and Dumb, 1874, Vol. XIX, No. 4: "Professor Alexander Graham Bell, of Boston University, was elected president of the convention. * * The president gave a description of a new method of investigating the mechanism of speech, invented by Mr. Oakley Coles, of England. He also exhibited some apparatus, loaned by the Massachusetts Institute of Technology, intended to render the vibrations of sound visible and to enable the human voice to record its own vibrations upon glass."

Another epoch-making advance in the study of speech grafs was made when Alexander Graham Bell sought the advice of Dr. Clarence J. Blake, of Boston, an eminent otologist and former president of the American Otological Society.

Again quoting from Bell: "I was struck by the likeness between the mechanism of the phone autograph and the mechanism of the human ear, the membrane of the one being loaded by a lever of wood, and the membrane of the other by a lever of bone. It appeared to me that a phone autograph modeled after the pattern of the human ear would probably produce more active tracings of speech-vibrations than the imperfect instrument with which I was operating. I thought, therefore, it would be well to obtain precise information concerning the shape of the membrane of the human ear, the shape of the bones attached to it, the mode of connection between the two, etc.

For this purpose, I consulted a distinguished aurist, Dr. Clarence J. Blake, of Boston. He seemed to be much interested in my experiments, and suggested that, instead of trying to make a phone autograph, modeled after the pattern of the human ear, I should attempt to use an actual human ear, taken from a dead subject, as a phone autograph. He offered to make an anatomical preparation for the purpose. He did so very shortly, before my departure for Canada on

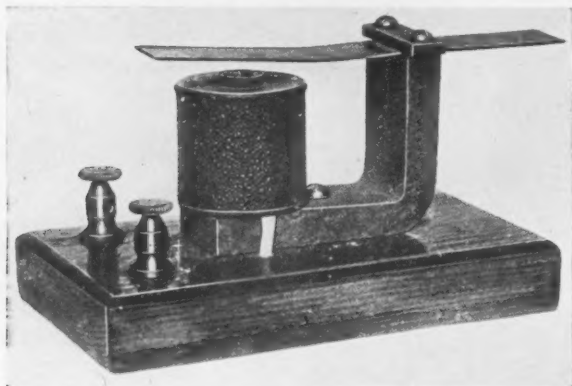


Blake's Anatomical Preparation of Drum Membrane and Ossicles.

my summer vacation in 1874. The specimen consisted of a portion of a human ear containing the membrane of the tympanum with two bones attached (the Malleus and Incus), the other bone (the Stapes) had been removed and I substituted for it a stile of hay attached to the Incus. I moistened the membrane with glycerin and water and arranged a sort of speaking-tube to take the place of the outer ear.

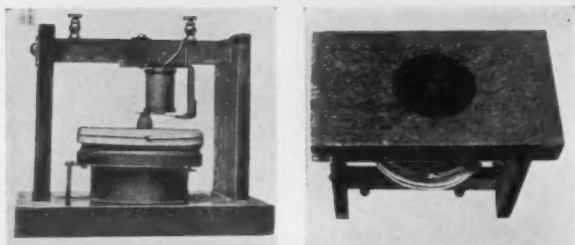
When a person sang or spoke to this ear I was delighted to observe a vibration of all the parts, and the stile of hay vibrated with such amplitude as to enable me to obtain tracings of the vibrations upon smoked glass."

To those not familiar with this phase of the life history of this remarkable man, the inventor of the telephone, it should be remarked that the incentives and ambitions that led to the discovery of the telephone were intimately associated with an overwhelming desire

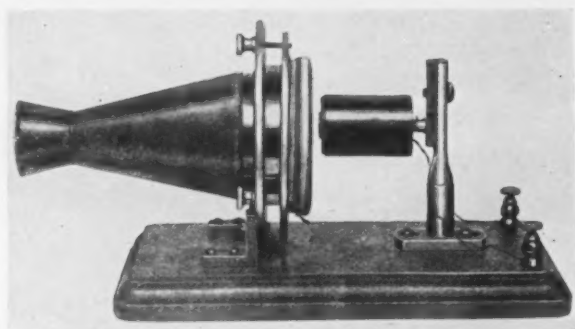


Bell's Vibrating Reed, the electro-mechanical principle of which forms the basis of construction and function of the Telephone.

on the part of Dr. Bell to create some device or instrument for the amplification of sound for the use of Mrs. Bell, who had been handicapped by deafness since early infancy. Alexander Graham Bell was by profession an expert in Speech and Teacher of the Deaf, and the inspiration of the telephone came to him, while a man in moderate circumstances, when he was racked in the choice of two activities, namely, to continue his work with speech and as a teacher of the Deaf or to proceed with his electric research and inventions, which finally culminated in the production of the telephone.



Alexander Graham Bell's First Telephone.

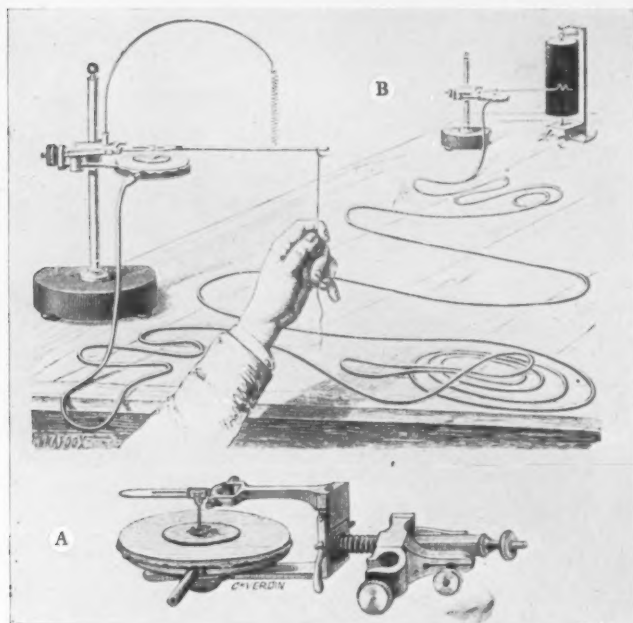


Bell's Original Centennial Magneto Transmitter.



Telephone Apparatus Patented in 1876 by Alexander Graham Bell. Photographed from the Original Instruments in the Patent Office at Washington.

The scientific study of speech sounds and their laboratory analysis and the fundamental study of hearing began with Helmholtz. The investigation of Speech and Hearing have always been so closely associated that it is difficult to consider their development as separate research entities. In the study of these problems Helmholtz had the advantage of a profound knowledge of physiology and a mastery of acoustics, and with this knowledge and simple laboratory equipment



A. Marey Tambour. B. Marey Grafting Set.

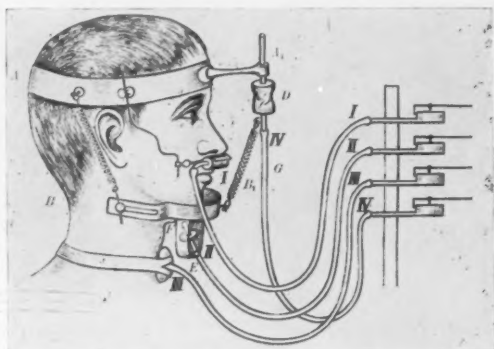
as he then had at his disposal, Helmholtz, in 1870, published his classic treatise, "The Sensations of Tone".

The work of Dayton C. Miller on "The Science of Musical Sounds", published in 1916, adds another chapter to sound analysis and the modern physical research of speech sounds.

To Professor M. Marey, of the College of France, and his profound and indefatigable labors in experimental physiology, we are

indebted for the most carefully devised system of grafology. His important researches included every phase and movement or vibration in the human body and he may well be proclaimed as the father of the myograph, the electro-cardiograph, the seismograph and the sphygmograph.

The fundamental principle on which most of these investigations rests is the Marey Tambour, a simple and efficient device with which the many, varied and important investigations of Professor Marey, of Paris, were made. This consists of a flat capsule spanned by a thin rubber diaphragm on which is mounted a small vertical staff carrying a light, adjustable stylus made of aluminum or celluloid.

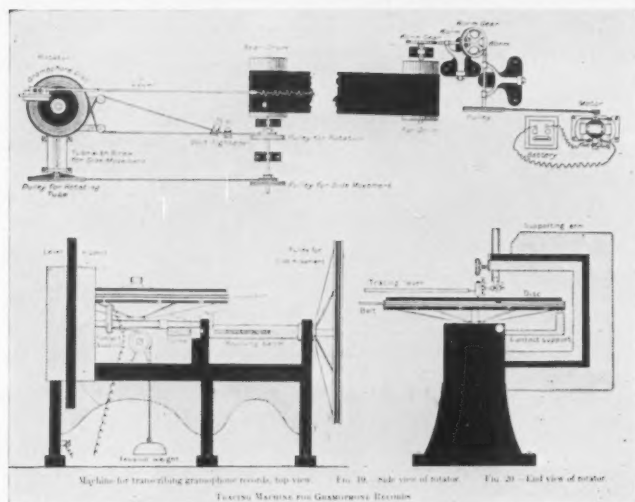
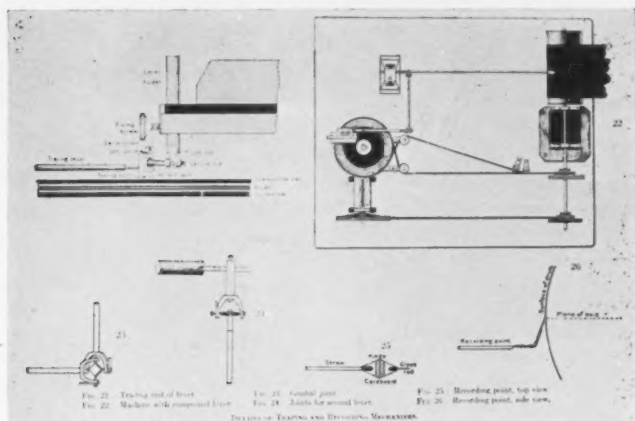


Zwaardemaker's Speech Recorder.

Marey Grafing Set.—To the capsule is attached a length of rubber tubing; the distal end of the tubing is connected up with that part of the articulation apparatus which it is desired to study or graf; the stylus is placed in contact with a revolving cylinder carrying a strip of smoked, glazed paper. When the stylus is activated its movements are recorded automatically on the smoked-paper roll. The myograph, or revolving drum, is operated by clockwork or electric motor.

Zwaardemaker's Speech Recorder employs four Marey Tambours in different positions and produces four simultaneous grafes of the several apparatus concerned in the production of articulate speech.

With electricity as an accessory to these research instruments a new era in the study of the grafts of speech has dawned. The phono-



Tracing Machine for Gramophone Records.

graph of Edison and the gramophone of Berliner were next called into use by phonetic investigators. The work of E. W. Scripture in experimental phonetics has been produced largely by the use of these

devices. The grafts of Scripture are engraved on wax cylinders and discs by these means and their reproduction and permanent con-

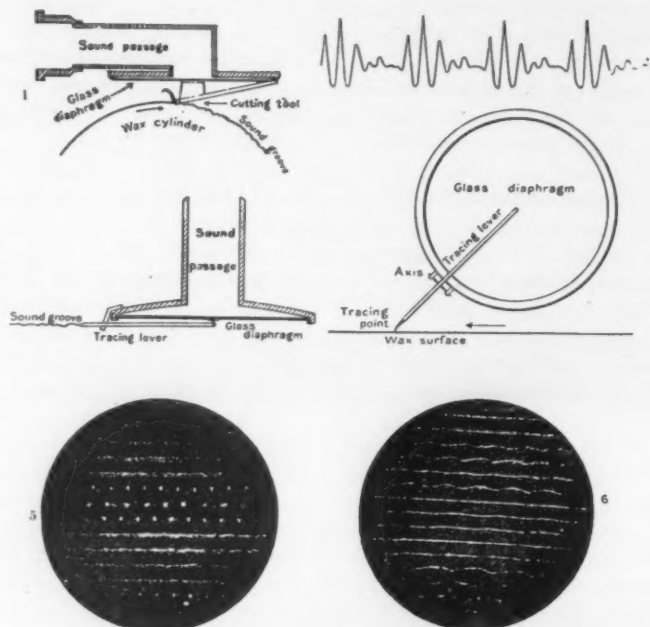


FIG. 1.—Phonograph recorder.

FIG. 2.—Tracing from a phonograph groove.

FIG. 3.—Gramophone recorder, section.

FIG. 4.—Gramophone recorder, front view.

FIG. 5.—Tracing from phonograph groove.

FIG. 6.—Gramophone groove.

Phonograph and Gramophone Recorders.

servations have simplified study in phonetic research. Phonetic records with the phonograph and gramophone, however, are still incomplete because of the inability to obtain accurate grafts for many of the delicate and sensitive speech grafts produced by various consonant elements. For this purpose a more sensitive system of grafting is required.

In 1924-25, Dr. Irving B. Crandall and C. F. Sacia, of the Research Department of the Bell Telephone Laboratories described modern methods whereby, with the most refined apparatus, highly accurate speech-wave forms have been procured. The analysis and interpretation of both vowel and consonant elements made possible by these records are the realization of an objective sought by Alexander Graham Bell and other early investigators of phonetic science half a century ago. A monograph on "A Dynamical Study of the Vowel Sounds and the Science of Speech", issued by Crandall and Sacia, was the result of an exhaustive study of 160 graphical records of vowel and consonant elements.

Crandall states: "In providing means for accurately recording sound waves use has been made of three devices recently developed in the Bell Telephone Laboratories and we believe that by properly connecting these together we have obtained a recording instrument which is superior in accuracy and power to any heretofore used. These three devices were each nearly free from distortion and such residual distortions as could not be eliminated were so controlled that they practically offset one another over a wide range of frequencies.

These three devices include: *a.* A condensor transmitter, as investigated by Wendt; *b.* a seven-stage amplifier; *c.* an oscillograph vibrator. In combining the transmitter, the amplifier and the oscillograph to form a complete recording apparatus there were two primary requirements: First, the set as a whole should be free from frequency distortion in both amplitude and phase; and second, the output of the set as a whole should be a linear function of the input within the working energy range at each frequency."

The oscillograms taken with the above apparatus were line records; in order to analyze these wave forms by the photo-mechanical method outlined below, it was necessary to transform the line record into a black profile. This was accomplished in the following steps: 1. A positive proof of the wave form on the original record was made on motion picture film; 2. the emulsion of the positive proof was then cut through to the base along the line of the wave by means of a stylus; 3. the entire strip was blackened (on the emulsion side) with printer's ink; 4. the emulsion on one side of the wave was stripped from the base, thus leaving the profile; 5. the beginning and the end were joined to form an endless belt.

In January, 1927, Mr. Joseph W. Legg, Research Engineer of the Westinghouse Electric & Mfg. Company, announced the invention of the "Osiso", a portable and modified form of oscillograph, by means of which the study of the speech elements was so simplified that another important link in the chain of these investigations was forged. Opportunely, I was in New York when this invention was announced, and promptly got in touch with the inventor and saw a demonstration of the performance of the Osiso. In an appeal to Mr. E. M. Herr, president of the Westinghouse Electric & Mfg. Company, to provide an Osiso for Central Institute for the Deaf, in St. Louis, I summed up my first impressions of this device as follows:

I recognize in the practical application of the Osiso many possibilities for speech instruction for the Deaf Child. He will be shown the wave appearance of a properly made speech element and encouraged to control his voice to produce the same wave. Faulty tone or voice production will be corrected as teacher and pupil see together the actual moving voice picture. Oral training of the Deaf Child will be placed on a more accurate scientific basis and he will acquire a better form and quality of speech.

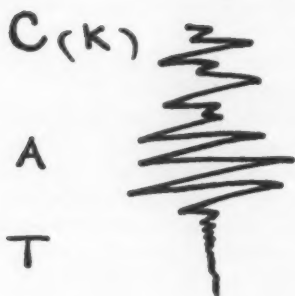
This appeal resulted in the presentation by the Westinghouse Electric & Mfg. Company to Central Institute for the Deaf, of a complete equipment and installation of this new model Osiso. The inventor, Mr. Legg, was requested to make this installation in person at the Institute, and with an oscillograph technician, spent three weeks in our laboratory in making this installation and instructing a group of our teaching staff in its operation and uses.

THE OSISO.

The purpose of my presentation on this occasion is to offer a preliminary report of the research work which has been undertaken at Central Institute for the Deaf, consisting of:

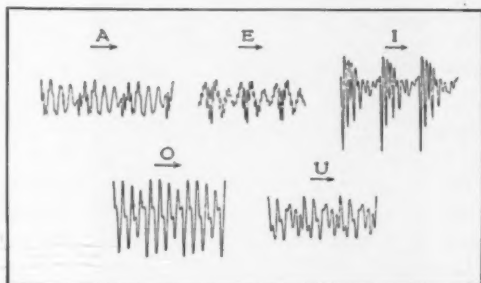
1. *The development of a new phonetic system of all vowel and consonant elements.*
2. *The preparation of phonetic textbooks for the education of the Deaf Child by this system.*
3. *The study of the pathology of speech as recorded by speech graphs in defective phonation.*
4. *The instruction of the Deaf Child to correct his own speech as made possible by the actual visualization of his defective speech graph simultaneously with the model speech graph of the teacher.*
5. *The more accurate analysis of qualitative and quantitative phonetics as presented by sensitive Osisograms.*

In initiating these experiments, I was uncertain as to the ability of the young Deaf Child to comprehend the many variations that are produced in the grafing of sound elements. The following simple test assured us of the intelligent co-operation of even a young Deaf Child: I selected four or five Deaf Children, ages 4 to 6 years, and placed them, singly, before the blackboard; I made a rapid chalk sketch of three hypothetical and difficult grafis indicating the word



"Cat", placing each graf in its respective position. This was erased as fast as it was drawn and the child directed to reproduce it. In each instance these young children reproduced the grafis, with chalk on the blackboard, with fair accuracy. Other words were tried with similar success and I was convinced that this problem of mental receptivity of the young Deaf Child would offer no handicaps.

The instruction of the Deaf Child to visualize the movements of the speech mechanism and the ingenious methods by which he is directed to appreciate by the sense of touch the vibrations of the sound elements that he himself produces are two entirely different and distinct forms of pedagogy. Visualization of the speech mechanism conveys to his mind the acts of articulate speech; feeling the vibrations on the bones of the face or of the head, produced by the sound vibrations in his own larynx, is but crudely interpreted by his sense of touch. By means of the Osiso, where the most delicate sound waves produced in the phonation of speech elements are trans-



lated into light waves of accurate character, shape and size, the eye of the Deaf Child is being educated to a new thought and to a finer appreciation of the physiological acts in which he is engaged in the production of phonation. This new feature in his education cannot be emphasized too much for it is here that the application of the Osiso will find its finest opportunities. There is an interesting psychological value in the fact that the Deaf Child can be taught to realize his own speech mechanism, an act which he has but imperfectly performed and incompletely appreciated heretofore.

GRAFS OF SPEECH ELEMENTS.

The first classification of speech elements for their intimate study as grafs produced by the Osiso is: *a.* Vowels; *b.* diphthongs; *c.* consonants.

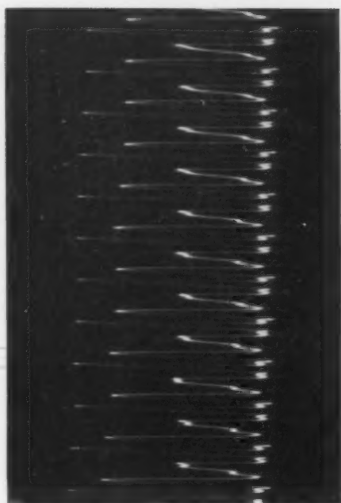
In our first experiments, it was noted that the vowel grafs varied considerably according to the intensity of the voice used and the timbre or quality of the individual voice selected. The intensity or volume of voice modified the amplitude of vibration or width of the individual graf. The timbre or voice quality modified the character of the graf by the addition of slight lines, notches or curves at the trough and crest of each vibration. To standardize the intensity or volume of voice, as spoken into the Osiso, a sensitive meter was introduced between the microphone and the Osiso audion tube. An arbitrary standard was adopted and all voices were measured by this standard. This enabled us to secure a graf of definite amplitude. It was also found that the difference in pitch used in the production of the vowel and diphthong elements influenced the height of the graf. We adopted b-flat as a standard of pitch in order to lessen this variation; this again insured standardization.

We propose, with the features of standardization, to construct a phonetic alphabet of speech grafs. These grafs are photographed by especially constructed cameras on longer or shorter films, depending on the character of speech sounds used. The films are developed and printed by the usual photographic process. The photographs, in actual size, are then reproduced in half-tones; the half-tone blocks are printed herewith.

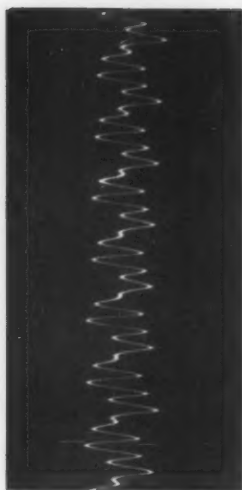
Heretofore, speech grafs have been presented in print in horizontal form; the speech grafs as produced on the revolving mirrors of the Osiso appear in vertical form and it has been thought more practical for study and for teaching purposes to use the vertical form in this research.

In these preliminary grafs occasional artifacts and mechanical shortcomings are found, due to the smearing of the lens over the lamp, the relative distance from the mirrors, the character and quality of the films used and the differences in technique in the development of the films. When these mechanical principles have been thoroughly mastered, the clarity of the graf, the uniformity and sharpness of line and detail will be produced. The unusual feature in the performance of the Osiso is its simplicity, both in the translation of the light graf from the sound wave and the ease and rapidity of photographic reproduction.

Ä



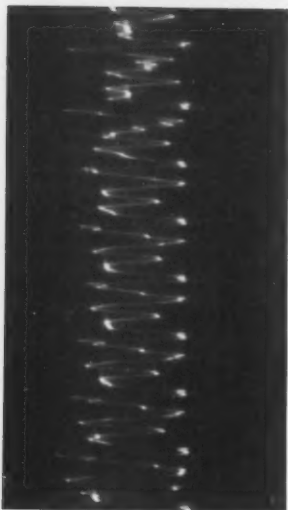
Ä=äh—(high pitch) as in *far*.

0000—(on b flat) as in *pool*.

E



\bar{E} —(on b flat) as in *eel*.

Ö

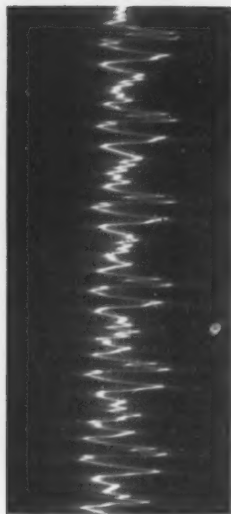
Ö=ö^h—(on b flat) as in *odc*.

Ā



Ā—(on b flat) as in *ale*.

)
E



\tilde{E} —(short) (on b flat) as in *bet*.

OU

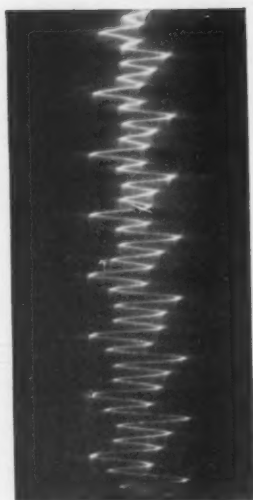


OU=OW—(on b flat) as in *owl*.

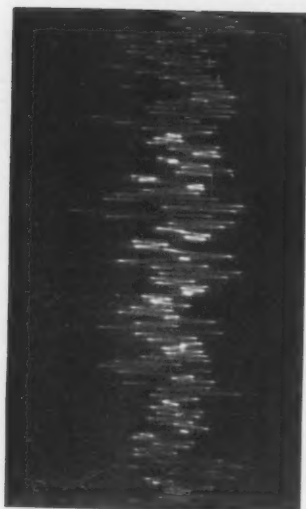
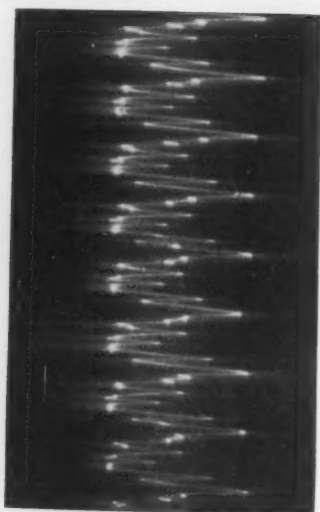


$\bar{\text{I}} = \text{äe} - (\text{on b flat}) \text{ as in } \textit{lie}.$

Ū



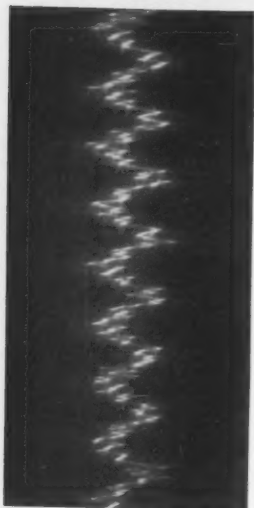
Ū=ē-ōō—(on b flat) as in *use*.

THTH—(without voice) as in *thin*.TH—(with voice) as in *the*.

SH

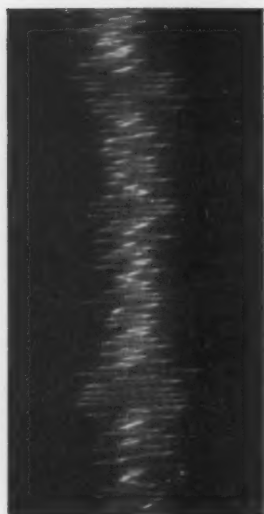


SH—as in *she*.

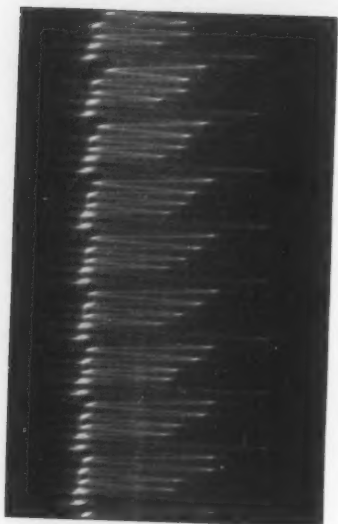
Z

Z—as in zero.

S



S—as in *say*.

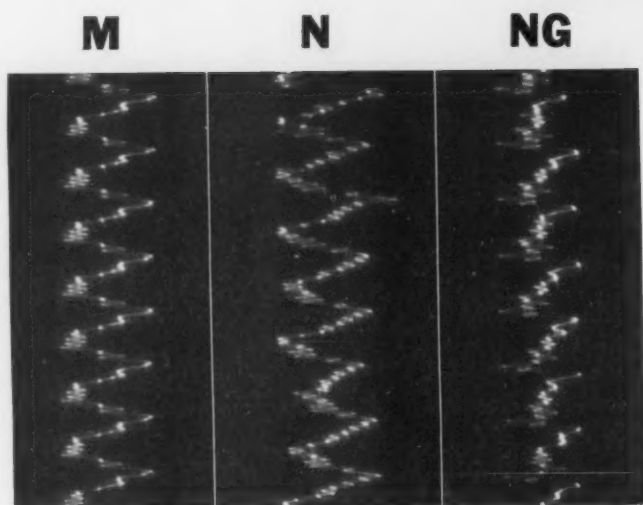
BB=bü—as in *but*.

X

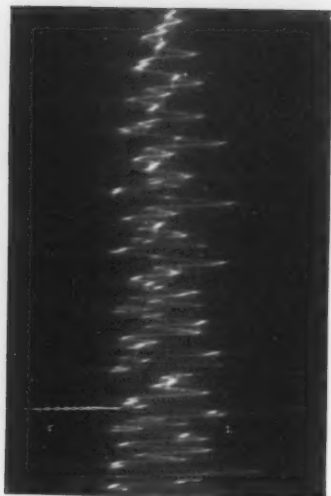


X=ks—as in (a)x.

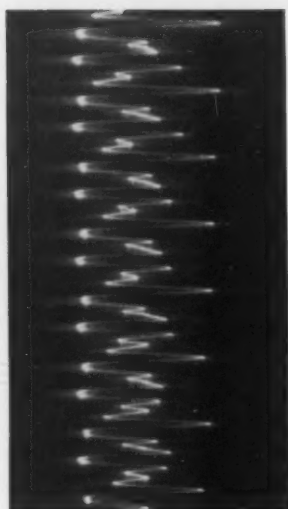
PP—as in *pie*.



A comparison of the graphs of the three nasal consonants.

GG=gü—as in *go*.

L



L—as in *lea*.

R

R—forward trills of tongue (on b flat)

Our first procedure has been directed toward the production of a model graf of every vowel and consonant element of speech. For this purpose we have selected a group of trained speech teachers, both male and female, making individual grafes of their several speech elements and comparing the Osisograms for quality and intensity. Composite Osisograms have also been produced in the attempt to establish standards, and it was found that in most of the speech elements so executed, when the voices of the several experimenters had been graduated to an intensity norm there was but little difference in the composite Osisogram and that of the individual voice.

The problem which concerns the instructor of the Deaf most intimately is the practical application of the problems of these splendid devices that translate waves of sound into tangible inscribed grafes and, as now made possible by the Osiso, into actual waves of light.

The appreciation of voice vibration by the sense of touch is a less delicate messenger to the brain than the recognition of the Osisogram by sight.

We who are seriously interested in the altruistic field of Otology and improvement in the speech of the Deaf Child are not so much concerned with the calculations and measurements, qualitative and quantitative analysis of sound elements, as we are with the actual problem of good speech in the handicapped human. Speech to the normal human is but an imitation of the sounds he hears. If the speech model is imperfect the imitation is imperfect. The Deaf Child hears no speech and in his pedagogy other avenues must be found for his speech instruction. The two sense-organs which offer a valuable substitute for his lost sense of hearing are sight and touch. The Deaf Child is taught to feel the vibrations produced in the act of phonation; he is taught to see the changes in position of the mechanism of articulate speech, but he has not yet been made to fully realize what process goes on in his own larynx in the production of a speech element. Reflected in the revolving mirror of the Osiso he sees a motion picture of his own phonetic efforts; he is taught to recognize his own imperfections in speech production and is trained to make his own correction.



Oslo Equipment Mounted Ready for Operation. Revolving and Tilting Mirrors. Studio Microphone. Meter for Registration of Voice Intensity.



Osiso with Specially Devised High-speed, Day-light-loading Camera Attachment Carrying Ten-inch Film for Photographing Voice Elements.



Osiso, Showing Special Day-light-loading Camera with Fifteen-foot Film Holder for Photographing Prolonged Speech Combinations (Words, Sentences, etc.).



Osiso, Showing Teacher Speaking Into Microphone. This Position Was Used in Making Model Grafts.



Osiso, Showing Teacher and Pupil, Using Separate Microphones. Teacher Gives Model Graf; Pupil Imitates.

The first practical objective, therefore, in the use of the Osiso will be to familiarize the eye of the Deaf Child with the model Osisograms that represent the elements of sound and speech. These forms should be impressed on the active child-brain as readily as the symbols of the alphabet or as the phonetic symbols of shorthand, and it should be possible to teach the phonetics of speech to the Deaf Child as readily as to teach him writing or reading by the usual symbols of the alphabet. Finally, the visual reception of speech as a rapid motion picture should offer no greater handicaps to the Deaf Child than his normal ability to rapidly read the text of a printed page.

We have had barely two months in which to study these first principles and in the Osisograms here presented I feel that we have indicated the first steps of a new and unusual phase of phonetic research that promises to develop another practical and valuable chapter in the speech education of the Deaf.

THE OSISO AS A PHONOSCOPE FOR THE DEAF.*

JOSEPH W. LEGG, E. E.

The oscillograph is an instrument capable of recording instantaneous values of electric currents. This instrument has been known for more than a generation. The Osiso is an extremely portable and highly efficient oscillograph. It is to the older forms of oscillographs what the kodak is to the old wet-plate cameras.

The inventor conceived the idea of an extremely portable, incandescent-light oscillograph, and phonoscope, when a student, in 1914. It is only within the last few years that such an instrument has been completed. "Osiso" is a coined word, in which: "OS" stands for oscillation, "I" for instantaneous, "S" for scope, and "O" for optical efficiency. The instrument, like the name, is compact, and may be turned upside down without changing its characteristics. Due to the highly efficient optical system in this instrument, the incandescent lamp gives better visual and photographic impressions, with a few watts input, than other oscillographs give with over a thousand watts consumed in each direct current arc lamp. The Osiso proper is but $6\frac{1}{4}$ inches wide, 9 inches high and $10\frac{1}{2}$ inches long. The whole outfit, including the motor-driven viewing attachment and the phonoscope distributor, weighs but 14 pounds. This saving in weight and energy consumption, amounting to over 90 per cent, would not make an oscillograph a good phonoscope for the deaf. The Osiso was designed with a multiple-wave distributor. This feature makes it possible to project four waves of speech, side by side, so that no two waves conflict, even though one speaks consonants into the microphone. Other oscillographs could be used to visualize the wave forms of vowels, but the explosive characteristics of the consonants are superimposed with the other characteristics so rapidly that the persistency of vision of the human eye causes a complete jumble of the waves in the ordinary oscillograph.

The multi-wave feature of the Osiso makes this instrument a practical phonoscope for teaching the deaf mute to speak more clearly and to understand speech by sight. Although the instrument was developed primarily for studying alternating currents in power lines, the inventor took the outfit to his home, in 1924, plugged it into his radio-

*Outline of talk given by invitation at the Sixtieth Annual Meeting of the American Otological Society, in the Auditorium of the New York Academy of Medicine, May 20, 1927.

receiving set, and observed (and photographed) voice waves picked up from distant stations. This operation was so very satisfactory that the inventor had no more hesitancy to advocate the use of the Osiso as a phonoscope for the deaf mute. In an article on the Osiso, in the *Electric Journal* of December, 1924, the inventor mentioned that this instrument should be valuable to the totally deaf person.

Many months later, Dr. Robert Gault, then working with the National Research Council, saw this statement, and made a trip to see the Osiso. Dr. Gault was very enthusiastic about the performance of the Osiso as a phonoscope. Unfortunately, a new outfit was not completed in time for Dr. Gault to give it a good try-out in his classes. However, Dr. Gault made the statement that the Osiso would be a great help in teaching the deaf mute.

Soon after this, Dr. Max A. Goldstein heard of the Osiso and the claim that it could be used to teach the congenitally deaf child to speak, and to teach the totally deaf to understand speech by sight. After an hour's demonstration by the inventor, Dr. Goldstein was convinced of the Osiso's value as a phonoscope for the deaf. As Director of the Central Institute for the Deaf, Dr. Goldstein got the co-operation of President E. M. Herr, of the Westinghouse Electric & Mfg. Co., and thus obtained a complete Osiso outfit for viewing and for photographing voice waves.

The inventor spent a week at the Central Institute for the Deaf, and saw the outfit given a practical demonstration with the deaf-mute child. The outfit, installed, included: a broadcasting-studio amplifier and microphone; a standard Osiso with motor-driven viewing attachment and phonoscope distributor; a daylight-loading rotating-drum film holder, for taking high-speed records of fractions of vowel sounds, and the like; a slow-speed, long-film holder, for taking permanent records of complete words; batteries for operating the lamp, motor, vacuum tubes, and microphone; and suitable switches for conveniently controlling the outfit. A console table accommodated the apparatus. A five-pole double-throw knife switch was used to change from visualizing circuits to photographing circuits. A four-pole double-throw switch was used to change from quadruple-wave visualization to duo-microphone visualization. The latter arrangement made it possible for the instructor to talk into one microphone and the deaf pupil into another microphone, so that both persons might see both wave forms, apparently simultaneously, side by side. The phonoscope distributor made this possible by cutting in first one and then the other microphone, the batteries of each being of opposite polarity.

As has been claimed by the inventor for years, this outfit should make it possible for the deaf to improve his speech, and possibly to learn to receive speech by sight over the telephone or radio. The relative frequency of all components of speech can be seen; the deaf person can reach and hold the exact pitch of the instructor's voice; expression, or emphasis, can be taught; the deaf person can practice repeating the same sound, indefinitely, since he can now sense any change in his voice waves; a textbook can be prepared which should be a great help in the instruction of the deaf child, since it can show oscillograms of the various characteristics of speech; and all this is made comparatively simple with the Osiso.

The inventor of the Osiso knows practically nothing about otology, and very little about the detail characteristics of speech. The work which Dr. Goldstein has started should be of great value to the totally deaf, and to the instructor of the deaf. Without Dr. Goldstein's energetic action on this humanitarian application of the Osiso, it might have failed of its mark.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

SECTION OF OTOLARYNGOLOGY.

Meeting of Oct. 15, 1926.

DR. HILDING S. ANDERSON presented a case of suppurative labyrinthitis with operation and recovery. The etiology in this case was scarlet fever and complicating otitis media.

It might not be amiss to remind ourselves briefly of the pathology of suppurative labyrinthitis. It may originate either from an infection in the middle ear, the infection gaining access either through erosions or less often through the round or oval windows. The commonest site for erosions is on the horizontal canal. After gaining access, the inflammation is localized at first, later becoming diffuse. As soon as the pus is spread through the entire labyrinth, function ceases.

The further course varies. The pus may corrode through at some point and drain either into the middle ear or mastoid, or into the cranial cavity. It may find its way into the sacculus endolymphaticus or spread along the nerve through the internal acoustic meatus. The resulting complications (cerebellar abscess, extradural abscess, meningitis) depend upon degree and mode of the spread of the infection. The commonest cause of death is cerebellar abscess. Not all attacks result in further complications. A large percentage heal spontaneously with total loss of function. Alexander states that 25 per cent of the deaf-mutes in the Austrian institutions are deaf because of spontaneously healed suppurative labyrinthitis. It is because of this fact—that so large a number heal spontaneously—and because of the high mortality of the operative procedures, that conservative measures are employed in treatment until intracranial complications render operation unavoidable.

The history of this case is as follows: A. H., age 9 years. Present complaints: 1. Earache. 2. Scarlet fever.

Present illness: The patient had an attack of scarlet fever during June. Three other children in the same family had it also.

June 24: He complained of poor hearing on the left side and slight earache.

June 25: The earache persisted and a paracentesis was performed.

June 27: He was seized with violent vertigo and vomiting.

June 29: First seen in consultation. The child was very much emaciated. There was slight tenderness at the tip of the left mastoid and slight thickening of the soft parts over the tip. The hearing was very poor. He heard whispered voice at 20 cm. The canal was swollen and contained pulsating pus. The drum was not well seen because of the swelling. Nystagmus was present toward both sides (rotatory-horizontal).

July 1: He again had an attack of vertigo.

July 2: The tenderness at the tip of the left mastoid still is present, although there is no swelling.

July 3: The nystagmus was still present toward both sides; but greater toward the right. The tuning forks and spoken voice were not heard on the left. There was no response to caloric tests.

The temperature up until this time varied between normal and 101°. There had been no signs of meningeal irritation.

July 5: He complained of pain over the mastoid.

July 7: He complained of slight headache in the evening.

July 8, 7 p. m. He had been restless all night and had cried with mastoid pain and frontal headache radiating to the vertex. Flexion of the head on the chest was painful and the neck somewhat rigid. The mastoid tenderness was more marked, although there was no swelling or redness. The pupils were

equal. Nystagmus toward the normal side was present with only a suggestion toward the diseased. The child seemed somewhat drowsy. The spinal fluid showed: Nonne positive, cell count 70.

It was decided to open the labyrinth. The operation was done in the home the same evening. A radical mastoid was first performed and then the labyrinth opened. No edema of the soft parts was found, but the mastoid cells were filled with pus and just beginning to soften. The posterior and lateral semicircular canals were opened, joined and followed into the vestibule. They contained a serous fluid. The posterior cranial fossa was opened in the region of the sacculus endolymphaticus. A large extradural abscess was found here. Owing to the poor condition of the patient, the radical operation was not completed. The ossicles were not removed; the Eustachian tube was not closed, and no plastic was done. The wound was left open with drains in place.

July 9: Slept most of the day. Was mentally clear. Temperature 100° to 101° . No vertigo.

July 10: Patient was comfortable but rather listless.

From this day on, the patient improved slowly but steadily. His temperature became normal and remained so. The nystagmus grew less.

The evidence of compensation upon the part of the normal labyrinth was most interesting to observe. By the first week in August he began attempts to stand. This was at first very difficult. By August 10, he could walk unsteadily by fixing some object straight ahead with his eyes. He spread his feet very widely and inclined his body toward the diseased side. Turning his head either way caused him to fall. By Sept. 4, he could run with effort. Rhombert's remained positive and he was unable to walk on a line or stand on one foot.

Control of body balance was attained first in those positions of the head which are commonly used. He learned first to stand when holding the head and eyes straight forward in a horizontal plane. If the head was placed in any other position, he fell. During September he acquired balance (when the eyes were open) with the head in the other positions in order as follows: downward, toward the sides and, lastly, upward. When the eyes were closed or covered with a sheet of paper he was unable to stand. If the head was inclined downward and forward he fell forward. In the other positions, he fell backward or toward the diseased side. During the past two or three weeks, he has learned to stand also with his eyes closed. With reference to the position of the head, this was again acquired in order as before, namely, horizontal forward, down and forward; toward the sides and, lastly, up and back.

Dr. Anderson briefly demonstrated the loss of labyrinthine function on the operated side. He now walks and runs well and can stand with his eyes closed. He cannot yet walk a crack or stand on one foot. He falls only when the head is suddenly turned up and back (demonstration). His caloric reaction is entirely negative, even when large volumes of cold water are used (demonstration). The hearing is entirely gone, as shown when the noise apparatus is placed in his normal ear and I shout close to the other (demonstration).

The operative wound has entirely healed.

There is still some mucus discharge coming from the ear canal. It may be necessary, on account of this, to complete the radical mastoid at a later date.

Dr. JOHN A. WINTER reported a case of osteoma of the frontal sinus, as follows:

John F., age 18 years, gave the following history (Nov. 11, 1925): During the month of June, 1925, the patient stated that he accidentally bumped himself against an iron bar over the region of the right eye. He paid no attention to this injury as there was no break in the skin and the blow was not of sufficient force to give him any particular pain. He did not have to discontinue his work.

Three weeks later a pain developed at the inner corner and over the region of the right eye.

Seven weeks from the date of the accident the right eye began to "get out of shape," i.e., the eye began to bulge forward, downward and outward.

He has never seen double since the time of the accident and the vision of the right eye today is 20/30 plus and of the left eye 20/20. Both lateral and frontal stereoscopic X-ray plates were taken at the Morgan Park Hospital, which showed a shadow over the region of the right eye.

Examination: The examination of the interior of the nose was negative. The fundi of both eyes also were negative. The X-ray plates showed the presence of a shadow in the region of the right frontal sinus. An exploratory operation was advised to determine the nature of the tumor of the frontal sinus.

Dec. 20, 1925: Under general anesthesia the right frontal sinus was opened. As soon as the outer wall of the frontal sinus was removed, a hard, ebony-like tumor that completely filled the right frontal sinus was encountered. The tumor was so hard that it was only with great difficulty that it could be undermined with a bone drill and then broken off piecemeal with a chisel. After this manner all the tumor was removed, and apparently the sinus cavity was perfectly clean at the end of the operation. The wound was closed with interrupted sutures and a small drain placed at the lower angle. The wound healed up *per primum* at the end of eight days, there being very little drainage at any time.

"Pathological examination. *Macroscopic*: These are eight pieces of bony material, measuring up to 0.6 c.m. in length. The pieces are rather compact and quite hard. *Macroscopic*: The material is formed by quite compact new-formed bone with only narrow Haversian's canals. One or two of these spaces, which are wider, contain fibrous bone marrow, which is infiltrated with a few lymphocytic and plasmatic cells. No malignancy.

"Anatomical diagnosis: Osteoma of the frontal sinus." (Dr. G. Berdez, Pathologist.)

DISCUSSION.

Dr. W. W. LEWIS stated that they opened a frontal sinus for an acute sinusitis. Like Dr. Winter's case, theirs was a compensation case and they knew they were going to have considerable trouble. They opened the frontal sinus supposedly for an acute suppurating sinus condition and in the sinus they found a very hard tumor, like Dr. Winter described, which was almost impossible to do anything with. They tried to get this out and drain the sinus, but the tumor blocked the way and they were unable to get anywhere as far as draining the sinus into the nose. They closed it up, very much dissatisfied because they had gone in for an acute sinusitis. The suppurating condition subsided and they knew that part of this osteoma was left because they were unable to dislodge it without cracking the skull. Dr. Lewis stated that, so far as he knew, the suppurating condition and the tumor had not caused the patient much trouble.

Dr. F. E. BURCH stated that he had a patient with a tumor and displacement of the lacrymal sac. They found a tumor on the orbital side and succeeded in rasping it out by using a heavy bone forcep and then sawing through. It had the same consistency throughout. The patient made an uneventful recovery, and there was no deformity. About a year later the patient returned and had a nose full of polyps on that side, which required further exenteration of the ethmoids. Dr. Burch stated that he had been surprised, in reviewing the literature, to find that the number of osteomas of the orbit is as high as it is. Often it is not necessary to have had any infection or serious injury preceding. The last case he had seen a few weeks ago was similar to this one (perhaps a smaller tumor), but the patient refused to have anything done.

Dr. R. C. SMITH stated that he recalled seeing this case of Dr. Winter's and he thought the doctor was to be congratulated on the result obtained. The only other case that he had ever come in contact with was one that he assisted with in 1912, which was later presented before the St. Louis Ophthalmological Society. That was taken for a malignant tumor. The eyeball was removed and the small tumor removed. In discussing this case later, Dr. Geer called attention to the fact that he might have gone into the orbit and pushed the eyeball aside.

OTOLARYNGOLOGY SECTION.

Meeting of December 17, 1926.

DR. J. A. PRATT presented three frontal sinus cases as follows:

The presentation of these sinus cases is to show that if the operations are properly performed under the turbinates, and attention given to the after-treatment, nearly all of the openings into the frontal sinuses and antra will remain patulous.

Case 1: Mr. A. came to the office, March 27, 1921, with an acute left frontal sinusitis, following seven years of chronic left ethmoidal and frontal sinusitis. The left anterior ethmoids were exenterated and the frontal sinuses opened at once under the left middle turbinate, with complete relief from pain. He returned in June, 1923, with an acute exacerbation, which cleared up with two irrigations.

In June, 1926, following scarlet fever, the irritation spread to the frontal sinus, which cleared up under four irrigations. On Dec. 12, 1926, he again returned with trouble following a two weeks' nasal infection. He was irrigated on Dec. 12 and 13.

Ever since the operation in 1921 there has been no trouble in passing a No. 6 Ritter frontal dilator.

Case 2: Mr. F. came to the office, April 29, 1926, with a chronic sinusitis, involving all the sinuses except the sphenoids, of over twenty years' standing. His nose was pouring foul pus.

His ethmoids were exenterated, the frontal sinuses opened, and a window operation was performed on each antrum; all this work being performed under the turbinates. He received twenty-four treatments, the last one on Oct. 10. All the openings made into the sinuses are patulous.

Case 3: Mrs. K. came to the office on August 12, 1926, with a chronic suppurative sinusitis, of two years' standing, of the right frontal sinus, ethmoids and antrum. The pus was profuse and had a bad odor. A thick, deflected septum was first operated upon; then on August 26 the right ethmoids and frontal were operated. On Sept. 13 a window operation was performed on the right antrum. The condition cleared up after ten treatments and the openings are patulous.

DISCUSSION.

DR. JOHN A. WATSON asked if it was Dr. Pratt's belief that the subturbinates operation can be done so that in all cases the opening will remain patent? Dr. Watson's own experience has led him to believe that it cannot. He said he had often made large openings, rasping away the ridge to a level with the floor of the nasal fossa, but in spite of that they very frequently close up in a short time. The same thing often happens after the preturbinates operation. Frequently it is impossible to keep it open except in the cases where a flap of mucous membrane has been turned over the edge of the wound. Personally, Dr. Watson believed that there are a great many antrum cases that cannot be cured by either the subturbinates or preturbinates operation and that it is often necessary to resort to the Luc-Caldwell operation. If, in the latter operation, one will make the incision high up, there is little more danger of unpleasant results, as far as the teeth are concerned, than there is in the preturbinates operation at least.

Dr. Watson said he did not believe that the use of a catheter, even of the largest size, solves the problem at all, so far as the subturbinates operation is concerned. If one makes the opening as large as it should be made it is difficult, if not impossible, to keep the catheter in place. An opening only large enough to admit and retain a catheter will almost certainly not result in cure in most of the cases. The question is one not merely of sufficient drainage; it is also one of ventilation; the admission of large amounts of circulating air into the antrum is of the utmost importance. The catheter does little more than allow one to irrigate the antrum with more or less ease. Indeed, Dr. Watson considered irrigation is often, if not always, an objectionable mode of treatment except perhaps for a short while following the operation, when it may be necessary in order to remove blood clots and inspissated discharge.

Success, in Dr. Watson's opinion, turns in the main part on drainage and large amounts of circulating air; neither of which can be obtained by means of a catheter. Gentle mopping of the interior of the antrum with a curved cotton-wrapped probe through an opening large enough to allow of its being done with the utmost ease, and occasional swabbing of the interior with a weak nitrate of silver solution is much to be preferred to any form of irrigation, in Dr. Watson's estimation. This, too, however, is likely to fail in cases of marked chronicity and particularly so where the antrum is partially divided into inaccessible recesses by incomplete septa, where there is a marked tendency to the formation of polyps, and especially where there is bone necrosis.

Dr. H. I. LILLIE stated that everyone concedes that in the surgical management of certain cases with upper paranasal sinus disease, the middle turbinate need not be disturbed. This does not hold true in all cases, however. One must think in terms of pathologic changes that take place as a result of disease and must individualize the patient and adapt the operation to the patient, and not vice versa. In one instance, drainage will control the disease and in another instance an operation which removes the disease will be required. Surgical technique, in Dr. Lillie's opinion, is a matter of personal adaptation. He felt that the majority of cases with maxillary sinusitis may be controlled by an intranasal operation. There are certain ones, however, which require the radical operation. More external operations are performed than are really necessary. Nasoantral windows may be kept open in the majority of instances. It was Dr. Lillie's personal opinion that the paranasal sinuses have been subjected to operative interference too frequently.

Dr. PRATT, in closing, stated that his object in presenting these cases was to show that the openings into the frontal sinuses and under the lower turbinate intranasally would remain patent in nearly every case if the operation and after-treatments were properly performed. He agreed with Dr. Watson's statement, if the mucous membrane covered the edges of the antrum, the opening will remain patulous. If the case does not cure with this aeration and drainage, you have done no harm and can continue with your radical operation. One is only sure of the patency of the upper frontal duct when the anterior ethmoids are entirely exenterated under the middle turbinate, and only the anterior portion of the duct enlarged.

Dr. Pratt stated that there are no 100 per cent operations. But if you can cure the majority of sinus infections by simple procedure and leave all the turbinates in place, why do a radical operation first?

He stated that a man came into his office two days ago and promised to be here tonight. This patient was operated upon intranasally by the late Dr. Ingalls, of Chicago years ago. At that time the anterior end of the middle turbinate was removed and the duct enlarged by a burr, destroying the entire mucous lining of the frontal duct. The duct remained patent for years with treatments, but eventually closed. A modified external operation was performed by a sinus surgeon in Cincinnati, but was doomed to failure because there was no mucous lining to the drainage duct. He was next operated upon by Dr. Skillern, of Philadelphia, who removed the remainder of the middle turbinate, exenterated the ethmoids and opened the frontal sinus intranasally, but this proved a failure because of the closure of the frontal opening. Dr. Pratt said he could see no opportunity for a cure except an obliteration of the frontal sinus.

Dr. Pratt stated that these cases shown tonight may have been simple and ready to cure themselves, but the accompanying X-ray plates show the conditions present. For years Mr. F. had suppuration, with polyposis, of all his sinuses, right and left, except the sphenoids. His ethmoids were exenterated, frontal ducts enlarged and windows made into the antra, all without removing the turbinates. The openings are all patent and the case dry and clean. The same is true of the other cases shown.

Dr. Pratt said he believed and operated in this manner on both acute and chronic cases. The danger in exenterating the vestigial ethmoid cells is nil, if one knows his anatomy and has the operative touch.

Dr. WALTER E. CAMP, Recorder.

OTOLARYNGOLOGY SECTION.

*Meeting of January 14, 1927.***Bilateral Mastoiditis Bacteremia. Dr. C. W. Fogarty.**

DISCUSSION.

DR. CARL LARSEN wished to congratulate Dr. Fogarty, not only upon the excellent results obtained in this case, but upon the splendid surgical judgment he showed. Dr. Larsen was of the opinion that it is possible to have, and perhaps many of these cases may be termed, otitic pyemia and are not true lateral sinus thrombosis. He believed the tendency at the present time is to do fewer ligations.

DR. FOGARTY, in closing, stated that there was one point he might stress in this case, and that was that he felt now as though this child had a bacteremia before admission to the hospital. Had a blood culture been taken upon admission, an earlier diagnosis might have been possible; and Dr. Fogarty thought freer use should be made of the laboratory early in these cases. Henceforth, in similar cases, he would do this in the hope that information thus obtained might help in the diagnosis.

DR. W. E. CAMP, Recorder.

OTOLARYNGOLOGY SECTION.

*Meeting of April 8, 1927.***Blood Transfusion, Combined with the Intravenous Use of Germicidal Dye, in Sepsis of Otitic Origin. Dr. H. J. Lillie.**

DISCUSSION.

DR. CARL LARSEN stated that he had used transfusion in three cases in the last year and a half with most striking results. He had in mind particularly one case that ran a septic course for about three weeks, with a temperature as high as $102\frac{1}{2}^{\circ}$ to 103° , and it looked as though they would have to go in and open the sinus. One transfusion brought about a most remarkable result. Another case he had operated on the mastoid and did a jugular ligation. The patient developed a septic endocarditis and a hemorrhagic nephritis. This patient was transfused three or four times and Dr. Larsen felt that if he had not been transfused he would have died. As Dr. Lillie stated, he felt it is also a splendid supportive measure before operation. Personally, Dr. Larsen said he was "sold" on transfusion.

DR. HORACE NEWHART said that he had had no very extensive experience with transfusions and none whatsoever with germicidal dyes in connection with lateral sinus phlebitis. Because of the excellent results he had uniformly obtained during a number of years he had been very enthusiastic over results of transfusions in cases of sinus phlebitis, especially with full blood. He had been inspired by the work of Samuel J. Kopetsky and Harold Hays. However, during the past few weeks his enthusiasm has been somewhat dampened because of an experience in the case of a girl of twelve having sinus phlebitis, and still in the hospital. He said he wished simply to relate the fact that notwithstanding ligation of the internal jugular and two full blood transfusions during the week after exposure and drainage of the sinus, apparently no direct beneficial results followed the transfusions. Blood cultures were all negative. The septic temperature persisted, and for many days the outcome of the case seemed doubtful. Ten days after the last transfusion the patient developed, at the site of ligation, an abscess of the neck, from which was obtained an abundance of pus but no growth on culture. Dr. Newhart stated that in all other cases in his experience, however, marked benefit was obtained from transfusion and on the whole his experience warranted great confidence in the procedure of transfusion. Dr. Newhart felt that transfusions are not resorted to often enough nor early enough in many cases.

DR. DOUGLAS WOOD asked Dr. Lillie regarding the effect of mercurochrome on the kidney.

DR. C. N. SPRATT stated that a man in ordinary private practice sees so few of these cases that it is difficult to draw conclusions. He recalled that when he

was an interne in New York, in 1902, intravenous injections of a formalin solution were enthusiastically advocated as treatment for septicemia.

Some twenty years ago Ehrlich announced his neosalvarsan as a one-dose cure for syphilis. Recently Young has written very enthusiastically on the use of mercurochrome in the treatment of infections. None of these, however, has fulfilled the hopes originally held for them by their enthusiastic advocates. Recently three cases of puerperal septicemia were reported from Bellevue Hospital in which mercurochrome hastened death.

Dr. Spratt called attention to the fact that blood transfusions and intravenous therapy are quite the fad at present. There are, however, certain dangers in such transfusions, and as most men are not in a position to match the blood of the patient with that of the donor, it would seem that—at least in cases where there has been a good deal of shock due to loss of blood and where fluid is therefore required—it would be safer to give Ringer's solution or a physiological salt solution.

Dr. Spratt stated that among the last 250 acute and chronic mastoids that he had operated on, he had had 21 cases of lateral sinus thrombosis with two deaths. Both of these were neglected cases in extremis when operated upon. Both died the day following the operation, which consisted of ligation of the jugular. The other 19 cases in which he ligated the jugular recovered. None of these were transfused, and none were given salt intravenously.

DR. F. M. TURNBULL said he had used mercurochrome in five cases and transfusion combined with acroflavin in one case of mastoiditis. He felt in this case the transfusions were of great help. The mercurochrome in most cases was given over repeated injections. There were two deaths; one a brain abscess case, and the other a streptococcic pyemia. In one case of a child with sinus thrombosis it was thought that mercurochrome was of very great benefit. The dye seemed of great benefit in all their cases.

DR. LILLIE, in closing, stated that when any new methods are suggested they have to be tried out over a period of time in order to find out whether or not they are of merit. His intention in giving this paper was to add to the sum total so that in time some conclusion may be arrived at. Dr. Lillie stated that it depended on the pathologic change encountered as to what method of attack is used at operation.

If the patient is very ill, it may be best to ligate the internal jugular vein before operating on the mastoid. If it was decided not to do this, the mastoid could be operated upon first, exposing the sinus, either removing the primary focus, emptying the sinus or ablation of the sinus could be done. If no bleeding came from the bulb end of the sinus, the neck operation can be performed. The postoperative temperature in some of these cases is sometimes influenced by wound infection. That the temperature curve has not become flat following operation has been disappointing sometimes.

In regard to the use of mercurochrome, Dr. Lillie said that its effect on the kidney has been reported as one of the dangers in its use. He stated that it was not his purpose to make the members feel that he was advocating the use of germicidal dyes. (Quoted closing paragraph from paper.) In extreme cases every means at hand should be used in combating the disease. Good reports had been given by others. Of course, Hugh Young is an enthusiast; he reports 76.8 per cent of cures. Porter has suggested refinements in the use of mercurochrome which have eliminated some of the dangers. Eagleton went to the Montreal meeting, intending to antagonize the use of mercurochrome, but talked to Porter before the meeting and his views were somewhat changed. Dr. Lillie stated that all the men knew Eagleton and the thing which convinced Dr. Lillie that there might be something to it was the fact that they could convince Eagleton of its value.

DR. CARL LARSEN asked Dr. Lillie if he had had any untoward effects from transfusion.

DR. LILLIE stated that he had never seen any untoward effect from transfusion, but stated that a hematologist should come in and do the grouping. He stated that he was going to continue the use of transfusion until it could be proven of no value, because of the results he had thus far seen in its use.

The Antrum. Dr. J. A. Watson.

DISCUSSION.

DR. J. A. PRATT stated that he thought all would agree that cases in each one's practice would be different. In his talk with Dr. Carl Waldron, in reference to the finding of polypi in the antrum, Dr. Waldron said he rarely found them. This finding also corresponded with Dr. Pratt's line of cases. When they were present, they originated at the antral ostium, which is in close proximity to the ethmoidal cells. These cells should be thoroughly eradicated to promote better ventilation of the nasal chambers if we wish to cure our antrum cases with an intranasal window operation. Dr. Ostrum, of Illinois, reports very good results by making a large opening in the region of the normal ostium, having a special anterior biting forcep for this surgery.

Dr. Pratt stated that, in making an intranasal opening, the technique may be at fault by making the opening too near the floor where is found the porous bone on which granulations form freely and close the opening. If the opening is made high under the middle turbinate, where the bone is thin, the mucous membrane quickly covers the edges of the opening and makes it permanent. Where the septum is straight and thin and the ethmoids normal or exenterated so that there is good ventilation and drainage, the majority of diseased antra will be cured by the window operation, and the remainder will need the radical operation.

Dr. McNaught, of the University of California, was quoted as stating that of 94 cases treated in this way, 90 recovered.

Dr. Pratt said he could not agree with Dr. Watson's theory of the cause of polypi, but believed they are the product of present or past secretions of diseased underlying tissue.

DR. F. M. TURNBULL stated that they had first used the method referred to by Dr. Knapp on a man who had a radical external operation. He had ethmoid cells going clear under the orbit of the eye. They had found this again in a man who had just one eye, who had retinal congestion, and it was very important to get these ethmoid cells exenterated.

Dr. Turnbull was of the opinion that one of the most important things is aeration and by taking down this wall (shown on diagram) one can always get aeration. It is difficult to clear out all the ethmoid cells through a small opening.

Regarding the polypoid antrum, Dr. Turnbull felt that it is the most difficult thing one has to diagnose. The X-ray is a most misleading thing in the diagnosis of these cases. When the X-rays are exposed just a medium length of time they give the bony structure, but not the membrane. There must be an extremely short exposure if one is to get the membrane. A diagnosis of polypoid degeneration is made on the line of the membrane in the outer wall and the floor of the antrum. A thickening or haziness of that line with the rest intact would indicate polypoid degeneration.

Dr. Turnbull stated that another method is the use of lipiodol, when the X-ray will show the lipiodol and the thickness of the membrane.

DR. G. C. DITTMAN stated, concerning the subject of antra, that he had had an interesting case. The patient was a man age 27 years, who had a tooth extracted. In the process of extraction the floor of the antrum was removed, producing an opening near half-an-inch across. The question was in regard to treatment. Dr. Dittman stated that there had been a form of treatment suggested for this defect, but he had not used it. In place of the operation he kept packing the alveolar cavity and daily washing the cavity through an antral trochar, and at the present time the opening was about $\frac{1}{16}$ of an inch in diameter. He brought the case up in order to inquire if any of the members could suggest a speedier method for cure which might have been tried out. The case had now gone on about four months and he felt that was a long time to treat an antrum. Dr. Dittman drew on the blackboard a sketch of the operation which had been suggested and asked if any of the members had used it.

DR. CARL LARSEN stated that it is always difficult to discuss anything after Dr. Watson is through and, as usual, his conclusions are sensible and he arrives at them after a careful study and consideration of the subject.

First of all, Dr. Larsen said he agreed with Dr. Watson that too few Luc-Caldwell operations are done. In the subacute antrum a window resection is the operation of choice, but after a case has gone on for several months the only thing to do is a Luc-Caldwell. Dr. Larsen stated that his experience in doing window resections is that they invariably close after a period of time.

DR. H. J. LILLIE asked Dr. Watson what he would think of the term "hyper-secretory" instead of "catarrhal." Also, in regard to what both Dr. Watson and Dr. Larsen had said, Dr. Lillie stated that he was of the same opinion, i.e., that pediatricists are poor rhinologists.

DR. FRED PRATT stated that he had had a number of cases from Lymanhurst and General Hospital with positive X-rays, but he refused to touch these cases unless he had X-rays of his own. One case came to him with a positive X-ray and he found that ten days had elapsed between the time the child came and the time the X-ray was taken. On having another X-ray taken, it was negative. Dr. Pratt felt that rhinologists ought to be very skeptical on these reported X-rays in children.

DR. E. S. SROUT stated that he hoped someone would answer Dr. Dittman's question as to how to close these holes sometimes made in extracting teeth. He had had a case in which the opening was in the alveolar process and below the antrum cavity. Not only had two teeth been extracted, but the bridge of bone between the teeth, together with the floor of the antrum, had been removed. He had tried the operation Dr. Dittman mentioned, with a large flap, but he felt that there was very little tissue there to work on. However, he had been able to cover the entire cavity with a flap taken from the palate, but inside of ten days the flap sloughed, the sutures cut through, and the patient still has the opening. He had not seen the patient recently. Dr. Strout said it seemed practically impossible to him to close that opening with any kind of flap. He thought it might be possible to remove the alveolar process so as to get nearer the floor of the antrum and cover it in that way. Dr. Strout said he would be very glad to have anyone give him any suggestions as to how to close an alveolar opening of that size.

DR. WALTER E. CAMP, Recorder.

OTOLARYNGOLOGY SECTION.

Meeting of May 13, 1927.

A Rare or Hitherto Unrecorded Cavity with Fluid in the Bony Nasal Septum and the Crista Galli (with lantern slides). Dr. Virgil J. Schwartz.

DISCUSSION.

DR. W. E. CAMP said he would first like to compliment Dr. Schwartz on this very fine piece of work and also on the lantern slides. He wished to ask Dr. Schwartz how far down in the septum these cystic cavities extended. Dr. Camp felt that this paper illustrated another point which one encounters very frequently, and that is, why haven't we seen these cavities in the X-ray before? He felt that no attention had been paid to most of these cavities in the septum; and to him it was surprising that, in doing submucous operations, they had not been encountered more often in the operative work.

This is a very fine contribution and Dr. Camp felt that Dr. Schwartz was to be complimented on it.

DR. FRED PRATT stated he had had two cases, both cysts in the septum; he was sure they did not extend to the crista. He had seen the case Dr. Schwartz had, which was very extensive. Dr. Pratt stated that when he first encountered this condition it rather frightened him.

DR. J. A. PRATT stated that he had looked over their X-ray plates for 1926 and out of 110 plates he found the crista pneumatized in 27 per cent. He showed two plates, one where the cell was particularly well defined and of typical appearance. In the other the crista cell was very large and filled with fluid. Dr. Pratt stated that he had spent some time looking over the sinus specimens of Dr. Prentice at the University of Iowa and found only one with a cell in the descending ethmoid plate.

Dr. Pratt was of the opinion that pneumatization of the crista was due to anatomical development. If the frontal sinus was not well developed, the crista galli was not in contact with the perpendicular plate of the frontal bone. If the frontal sinus was well developed and deep, the crista is attached to the anterior plate and the pneumatization would extend from the frontal cell, as shown in drawing.

DR. J. M. ROBINSON inquired whether in the course of the essayist's investigations he had been led to believe that, because of cell formation in the upper parts of the septum, there might be increased risk of opening into the cranial cavity during a high or posterior submucous operation. And, secondly, whether the cell formation described might predispose to traumatic deflections. He stated that he had, himself, recently examined the X-ray plates of nine nasal fractures, and in two of these there appeared "cyst-like" spaces in the upper septum.

DR. SCHWARTZ, in closing, stated, in reply to Dr. Camp's question as to how far down this cavity extended into the septum, that he had purposely dwelt at some length on the size of the ethmoid bone to show how large these cavities can become. They may come down to the level of the lower margin of the middle turbinate. He did not become suspicious of such a thing before this cavity was seen, because the cavity became pointed and constricted at its lower end and therefore resembled only a thick, bony septum from anteriorly and below.

Dr. Schwartz stated that the figure quoted by him as 2 per cent included cavities of all types in the septum; by far the majority of these were posterior, that is, sphenoidal outpouchings. The instances of direct pneumatization from the frontal down are very rare but are present nevertheless at times. More than three-fourths were cavities extending from behind forward.

In regard to Dr. Robinson's question, Dr. Schwartz felt that, as regards the danger of opening into the brain cavity when such a complication as this is found, he would not consider that there would be any danger at all. He did not think these are cysts, a true cyst being an entirely different pathological entity from an infected cell. From the point of view of operative manipulation, Dr. Schwartz felt that there would be no more danger in operating such a case as this than there would be in a normal case.

In answer to the question concerning the cribriform plate, Dr. Schwartz stated that fortunately he did not find there was any weakness in the plate. He did not think there would be, although he admitted proceeding cautiously. The bone was thinner by half than if the cavity had not been there, but he was not so alarmed after he found that there was a solid roof to the cavity.

With regard to the danger of fracture of the septum, Dr. Schwartz could not say. He understood that this meant traumatic fracture. He said that most of these cells are back rather far and, as is known, most fractures of the septum are found anteriorly, so he doubted that the fracture would extend back that far, although it might.

The President wished to congratulate Dr. Schwartz on this paper and thank him for the very fine presentation.

DR. WALTER E. CAMP, Recorder.

THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA.

OTOLARYNGOLOGICAL SECTION.

February 18, 1927.

Dr. McClintock, of Quantico, Va., presented two cases with complications following tonsillectomy under local anesthesia, as follows:

Case 1: Good risk. Scarred hypertrophied tonsil. Nothing unusual at operation. Seven hours later suddenly developed livid edema of fauces, soft palate and pharynx, which progressed, and in two and a half hours necessitated emergency tracheotomy. Died two days later, heart began fibrillating with lung edema supervening.

Case 2: Peritonsillar abscess. Drained right side. Nine days later tonsillectomy. Six and a half hours after operation livid edema about right tonsillar wound, which progressed, necessitating tracheotomy to save heart. Condition gradually cleared. Abscess in tissue at right angle of jaw drained. Recovered. Left side not involved.

DISCUSSION.

DR. TRIBLE had seen these cases in consultation and was of the opinion that the camphor injections used had some etiologic relation to the edema.

DR. WILKINSON remarked that there is objection to operating in the presence of acute infections, and thought that the second case might have occurred on account of operating so soon after peritonsillar abscess.

On Hemorrhage As a Complication of Tonsillectomy. Dr. Walter Wells.

Referring to the very prevalent fear of hemorrhage by the public, and the widespread hearsay evidence of disastrous results, contrasted with their infrequency in practice of the specialist, Dr. Wells thought this must be due to the fact that tonsil operations were too often performed by incompetent operators.

Stressing the importance of a thorough knowledge of anatomical conditions, Dr. Wells exhibited some original charts showing the vascular supply and the common sites of bleeding.

One should always look for the existence of pulsating posterior pillars as evidence of anomalous internal carotid, more frequent than usually supposed.

The essayist demonstrated the method of using the instrument designed by him for easily placing suture ligatures in the tonsil fossa.

DR. ZINKHAN said he has had only one case to take back to operate upon. He thought tonsillar hemorrhages are due to bad surgery. Dr. Zinkhan criticized *finger enucleation* as unsurgical and claimed that it causes much more immediate bleeding, and, after or secondary hemorrhage. He thought that rough, unsurgical methods caused after-hemorrhages. He criticized the use of a Kelly's clamp in the operated fossae. Better surgery means less hemorrhage.

DR. BENNETT remarked that Dr. Wells should reread his paper before the general society. He suggested that the general practitioner should be taught that tonsillectomy is a special operation and should not be done except by one specially trained. Dr. Bennett has never had to return a patient to the operating room. He puts on a clamp for an hour or so. Dr. Bennett reviewed the development of tonsillectomy operations.

DR. WILKINSON remarked that the majority of serious tonsillar hemorrhages are due to defective tonsil surgery. If one hugs the capsule closely, serious hemorrhages are not likely to occur. He uses the draw loop ligature recommended by Coakly for tying the vessels. He uses No. 4 braided black silk as a tie.

DR. FLYNN advocated capsule splitting operation. If the capsule is not injured you get no hemorrhage. He recommended suturing a sponge in the tonsil fossa.

DR. MORGAN (general surgeon) mentioned the fact that the tonsils bleeding was at least visible, which is not true of abdominal hemorrhage. He stressed the fact that bleeding time is more important than coagulability time.

DR. MOFFETT experiences no harm from the use of adrenalin. The field can be reanesthetized by tying or blocking of nerve, thus avoiding a general anesthesia.

DR. WELLS, in closing, said he did not approve of sewing up gauze in the tonsil cavity. He reports that Dr. McReynolds, of Texas, formerly sewed up the tonsils but he does not do so now. Dr. Wells stressed the fact that spurring points must be tied; and insisted upon the importance of clean surgical work.

Two Cases of Parotid Abscess. Dr. Allen.

Case 1: Parotid abscess following acute otitis media of four weeks' duration. Operation: an incision was made in the anterior canal wall, about 1 c.m. from the external meatal opening and about 1 c.m. in length, directing the dissection forward toward parotid gland. After finding the abscess, two rubber drains were sewed in place. The patient was presented.

Case 2: Seen in consultation with a pediatricist. Provisional diagnosis: broken down lymph gland. This was aspirated on two successive days, and X-ray used. The child being worse on the third day, the abscess was drained, as in the first case. *Streptococcus hemolyticus* in pure culture was found. Patient recovered.

Dr. Allen suggested that this operative procedure would avoid the ugly facial scar usually produced.

DISCUSSION.

DR. MORAN said that we should differentiate parotid abscess from lymph gland abscess. He reported a parotid abscess in a nurse following dental extraction. She had a salivary fistula, which healed by the use of silver nitrate applications. This patient had a partial paralysis of a branch of the facial, from which she recovered.

DR. MOFFETT reported a case of an old man who got well by dilating Stenon's duct.

DR. ZINKHAN reported a case of parotid abscess following acute appendicitis. It was cured by drainage through Stenon's duct.

DR. ALLEN closed by saying that general surgeons remark that parotid abscess follows general infections, but he believed that no one had reported a case from ear infection.

OTOLARYNGOLOGICAL SECTION.

March 18, 1927.

DR. HANS BRUNNER, of Vienna, addressed the Society on otosclerosis. The following is an abstract of his remarks:

Otosclerosis is a primary disease of the bone, which produces circumscribed plaques in the capsule of the inner ear. These plaques can be located at various places in the bony capsule. The chief places are the region of the windows, the top of the cochlea, the internal meatus of the petrous bone, and the concavity of the frontal semicircular canal. It is, therefore, wrong to name only those cases otosclerosis in which the disease is located in the region of the windows. These last cases are easy to diagnose. But we must include those cases in which the lesions are found elsewhere, as indicated above. These are more difficult to diagnose.

Otosclerosis is not an acquired disease, in this sense, that everybody can get it. That otosclerosis may develop, a predisposition is necessary. This can be shown microscopically. We find the signs of this predisposition *a* in the membranous inner ear, *b* in the modiolus, *c* in the bony capsule of the inner ear. In the membranous inner ear we find atypical structures (cysts in the stria vascularis, atypical epithelial formations of Alexander, etc.) which show a disturbed development of the membranous inner ear, and further, a slight atrophy of organ of Corti, especially in the basilar portion of the cochlea. In the modiolus we find as a rule only slight abnormalities, for instance, mem-

branous septas between the convolutions of the cochlea, but we can also see in these cases, that a part of the modiolus is not developed at all, what we find also, in a special type of congenital deafness (type of Mondini-Alexander). In the bony capsule of the inner ear we find instead of the normal lamellar structure of the bone, plaques, in which the bone fibrils do not produce laminae but a network (bone network). All these changes show that the development of the inner ear is disturbed, and these disturbances in the embryological development of the inner ear predispose to the development of otosclerosis.

These disturbances in the embryological development of the inner ear are, of course, not identical with otosclerosis. In order that otosclerosis in predisposed cases may develop, another factor is necessary. What that factor is is not known at the present time. There exist three theories which endeavor to explain this unknown factor. One theory is that of Wittmaack, who claims that otosclerosis is produced by passive hyperemia of the petrous bone. This theory is not acceptable, because we know from microscopic examinations of human petrous bones, that a passive hyperemia does not influence otosclerosis in any way. The next theory is that of O. Mayer, who claims that otosclerosis consists of benign tumors of the petrous bone. Two facts militate against this theory: first, it is surprising that otosclerosis, if it is a benign tumor, does not grow in the direction of least resistance, i.e., in the middle ear, or in the spaces of the inner ear. Of course, we know that otosclerosis often produces little exostoses, which grow especially in the scala tympani of the basilar portion of the cochlea, but always otosclerosis affects especially the petrous bone much more than the free spaces of the inner ear and the middle ear. Second, if otosclerosis really consists of benign tumors, then it is surprising that these tumors always affect only special places in the petrous bone. This point is easy to explain, if we remember that just these places, where the otosclerosis is located, are the entrances of the chief blood vessels into the petrous bone. If we remember, further, that otosclerosis belongs to the dystrophic diseases of the bone, and that all dystrophic diseases of the bone are produced by disturbances in the function of the endocrine glands, then it is clear that otosclerosis will be especially located where the endocrine glands can affect the bone in the most intensive way, and this is at the entrance of the chief blood vessels. This explanation indicates that otosclerosis is a dystrophic disease of the petrous bone which is developed from disturbance of the endocrine glands system on the basis of a congenital under-development of the petrous bone and the inner ear. Of course at the present time we do not know what this disturbance of the endocrine glands is, in spite of the fact that many otologists have found in cases of otosclerosis various disturbances of the endocrine glands.

From these examinations we can draw the conclusions for the treatment of otosclerosis. It is clear that the predisposition for otosclerosis, if it once developed, cannot be influenced. In order to prevent the development of this predisposition it is necessary to observe the teachings of social medicine, i.e., all factors which can influence the embryological development of the body adversely should be avoided (marriage between relatives, alcoholism, lues of the parents, etc.). The second factor, i.e., the endocrine disturbance, is not sufficiently well understood at the present day to enable us to give definite treatment. We can only say that from the microscopic findings it does not seem very probable that we could influence otosclerosis, when it is completely developed, by treatment. Good results might be hoped for by giving prophylactic treatment to those persons of otosclerotic families. Future observations will teach us whether the prophylactic treatment with phosphorus and calcium, before the otosclerosis produces clear clinical symptoms, has the desired effect. This is the best treatment from the pathological standpoint which has been found to date.

Lung Abscess; Report of a Case. Dr. J. H. Bryan.

This was a case of lung abscess following unresolved pneumonia in an adult. Dr. Bryan remarked on the frequency of lung abscess following tonsillectomy. He commented upon the great diagnostic aid in the use of lipiodol and the X-ray in these cases. He divided the treatment into: 1. Treatment by com-
children. 3. Opening of the lung by the general surgeon.

pression. 2. The bronchoscope, especially serviceable in the treatment of He reviewed the differential diagnosis, especially with reference to bronchiectasis.

DISCUSSION.

DR. WILKINSON expressed his appreciation of the work being done for the lung abscess cases, and remarked that a large percentage of these cases were preventable, as they were the result of indifferent, if not bad, tonsil surgery. The avoidance of traumatism, the control of hemorrhage, and the avoidance of the insufflation of tonsillar debris will prevent the majority of these post-operative cases.

DR. FLYNN remarked that careful tonsil operation was the key to prevention.

DR. BRYAN, in closing, remarked that post-tonsillectomy abscesses were usually due to insufflation of blood and debris at the time of the operation.

DR. OSCAR WILKINSON, Reporter.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

February 21, 1927.

Persistent Hoarseness. Dr. E. B. Cayce.

Dr. E. B. Cayce presented Miss K. R. with persistent hoarseness following tonsillectomy. Tonsils had been removed nine years ago. Up to that time had never suffered, except for occasional attacks of hoarseness and occasionally would lose her voice, but since the tonsillectomy has been constantly hoarse.

Since that time she has never lost the voice entirely. Constant use of the voice produces at times an aching of the throat. Atmospheric conditions also tend to increase the hoarseness.

DISCUSSION.

It was the general opinion of the Academy that the case was one of pure hysteria, as all examinations were negative.

Tubercular Ulceration of the Larynx. Dr. Herschel Ezell.

Dr. Herschel Ezell presented Mrs. F. M. M., a widow, age 24 years, referred to him on account of hoarseness and cough.

History: Patient has had present complaint for three months. Condition growing worse. Had "flu" during Christmas, 1925, and has been coughing some since. Had child born dead at full term, no other miscarriages. Patient has gained weight, and is robust, weighing 127 pounds. She states that she has been trying to reduce. There is no history of tuberculosis or syphilis in the family, or in her case. Her husband died of typhoid fever three years ago.

Examination showed extensive ulceration of larynx. The right side of the larynx shows the typical mouse-nibbled appearance. The ulceration extends from just below the epiglottis above to a point well below the vocal cords, involving the cords. The patient was sent to another doctor for Wassermann and examination of sputum. The Wassermann was negative, but the sputum was loaded with tubercular bacilli, according to the report.

X-ray showed marked involvement of the right lung throughout, but more especially in the upper lobe. The lower part of the left upper lobe is involved. It will be noted that the most extensive and deep seated ulcerated side of the larynx, namely right, is on the same side as the most involved lung.

DR. R. J. WARNER, Secretary.

THE PHILADELPHIA LARYNGOLOGICAL SOCIETY.

Meeting of February 1, 1927.

COLLEGE OF PHYSICIANS.

Cleft Palate; Postoperative Result (Dorrance Method). Dr. George M. Dorrance.

Dr. Dorrance showed the postoperative result of a cleft palate case that he exhibited at the last meeting. In this case, you will remember the case had a short and deformed palate, the result of a former operation. The tissues over the hard palate were raised as two flaps and separated from all attachments to the palate bones. It was then noticed that the tensor palati muscles were preventing the soft palate from being placed against the posterior wall of the pharynx. On dividing the hamular process and lower end of the internal pterygoid plate, the whole palate fell backwards until this was accomplished. The two sides were then in contact and were sutured together without tension. You will note we have a long and movable palate. In this case, you will note there is a small opening into the nose behind the anterior teeth. If this opening does not close of its own accord, it will be covered by a plate. The speech has been improved. She will not require straightening of the teeth and further speech training. To obtain correct enunciation, it is essential that the palate be long enough to come in contact with the pharynx. This we have accomplished. The drooping and flaring of the nostrils has been corrected so she now presents an almost normal appearance.

Presentation of a Case of Tumor of the Oropharynx in an Adult. Dr. Margaret F. Butler.

Sessile benign neoplasms of the oropharynx are comparatively rare. Those of the nasopharynx, velum and hypopharynx, however, are more frequent and many pedunculated tumors originating in these areas have been reported. Lipomatous tumors on the posterior wall of the oropharynx are the rarest of all, and fibromata are seldom seen. Adenomata are difficult to differentiate from fibromata and lipomata.

Primary sarcomata of the oropharynx usually run a rapid course. In exceptional cases the progress is slow, duration being six to eight years.

Carcinomata in this region are rare, pain appears early, and the tonsil, soft palate, nasopharyngeal structures or cervical glands are generally involved.

Bosworth collected seven cases of fibromata of the pharynx, none of which were attached to the posterior pharyngeal wall. He says medical literature furnishes us with but few examples of neoplasms limited to the posterior wall of the oropharynx.

In most of the rare cases of sarcomata and carcinomata collected by Bosworth, the cervical glands were involved, except in one of fibrosarcoma reported by Billroth. In this case the tumor was removed with a snare and the patient was alive six years later.

Arnott reports a case of albuminoid sarcoma, sessile—cured. The tumor was ligated and sloughed off.

J. P. Roe reported a case in a woman, age 49 years. The neoplasm extended entirely across the oropharynx and was limited to the posterior pharyngeal wall. He removed the growth under local anesthesia, splitting the mucous membranes in midline. It proved to be an encysted fibrolipoma located beneath the sub-mucous connective tissue. It was adherent to the vertebrae, from which it was detached with difficulty. There was little hemorrhage with the operation and the surface was healed at the end of three weeks.

Report of Case: June 12, 1925, white woman, married, age 32 years, was referred to the Throat Clinic of the Hospital of the Woman's Medical College by Dr. Ida E. Gaston. She complained of a full sensation on the right side of her throat, with obstruction of her breathing when in the prone position and

she breathed heavily in her sleep. She had noticed these symptoms for about two months. She had no pain, and was not subject to colds, sore throats, headaches, nor ear troubles. She had had an impacted lower third molar in the right side, noticed in 1919. To relieve this, the second molar had been extracted.

Examination of the pharynx shows a sessile tumor on the right side of the posterior pharyngeal wall. It is ovoid in shape and extends vertically from 1 c.m. above the border of the velum to the lower limit of the hypopharynx and from the midline to the outer limit of the oropharynx. The anterior limit is flush with the relaxed velum palati. Color, pink, the same as the contiguous mucous membrane of the pharynx. It is of firm consistency, with smooth surface and no inflammatory appearance. There is no cervical adenopathy and no other pathology present.

Wassermann examination of the blood is negative, therefore gumma is excluded.

The patient was nursing a two-months-old baby and since this seemed not a favorable time to operate and symptoms were not urgent, I referred her to the Oncologic Hospital for the opinion of Dr. William Newcomet regarding the neoplasm. Dr. Newcomet thought radium treatment might be beneficial.

Following is the report from the American Oncologic Hospital: Mrs. L. G. First visit, July 1, 1925. Examination shows an indefinite mass at the base of the tongue, right side, which causes some fullness and difficulty in breathing. The mass, about 2 c.m. in diameter, elevated 1 c.m. or more. Treatment given, radium 76 m.g. for eight hours, outside treatment.

July 24, 1925: "Examination shows the mass is smaller." Radium, 16 m.g. direct. Aug. 21: "Looks better." Oct. 30: "Looks well, very marked swelling in the right tonsillar region, some discomfort in swallowing." Oct. 31: Radium, 100 m.g., 10 hours, outside treatment. Nov. 9: Radium, 100 m.g. in silver capsule for one hour given in mass inside. Dec. 4: Radium, 100 m.g., 10 hours. Dec. 11: Radium, 45 m.g., one hour in throat. Dec. 30: "Mass in posterior pharynx is still unchanged." Jan. 22, 1926: "Complaining of tooth being sore." Apr. 30: Radium, 29 m.g. in one needle put in throat for one hour. May 15: Radium, 100 m.g., 12 hours, outside treatment. June 18: Radium, 45 m.g. in silver capsule for 1½ hours in mass. July 14: "Very little change." Sept. 19: Radium, 100 m.g., 12 hours, outside. Nov. 3: "Examination shows mass about the same." Dec. 4: Radium, 76 m.g. for 36 hours. Jan. 21, 1927: "Growth seems much smaller."

As I see this growth tonight it appears exactly as it was at my first examination, June 12, 1925. Evidently it varies in size from time to time.

DISCUSSION.

DR. MACFARLAN stated he had a case which was quite similar and was taken care of by Dr. Newcomet, who treated it with radium.

A tonsillectomy was accompanied by alarming bleeding from one fossa—a week subsequent to the operation a rapidly growing sarcoma appeared in the fossa. In three weeks' time there was as much tissue present as would be represented by the average tonsil. Radium emanation needles inserted in the mass caused it to shrink away completely, but one treatment with radium was given; there has been no recurrence in four years.

DR. LOUIS S. DUNN: Judging from the history and appearance of the tumorous mass in the pharyngeal wall, I believe it is not of a malignant type. Inasmuch as the patient has had this condition for a period of over two years without the involvement of the surrounding areas, I should say that the neoplasm was of the fibromatous type of fibroadenoma, rather than sarcoma. A sarcoma of two years' duration, even when treated with radium, would have given evidence of metastasis either to the lungs or to the meninges, for we know that sarcoma gives metastasis by way of the blood stream. Operative procedure in this case should be used and if hemorrhage of a troublesome nature is anticipated, a primary ligation of the external carotid artery will enhance a successful removal of the tumorous mass. If radiation is resorted to in these conditions, I believe that deep X-ray therapy is more effective than radium.

DR. GEORGE M. DORRANCE: This case could not possibly be sarcoma, since it has been of the same size all the time. It might be a fibroma, lipoma, or

possibly an abscess. With reference to radium and X-ray, it is interesting to follow up the results obtained. Every Monday in the Radiological Clinic of the Philadelphia General Hospital, we have splendid opportunities for doing this. Radium is implanted in gold tubes instead of glass, as in the old method. This prevents the excessive sloughing which used to occur. It is remarkable what a beneficial effect radium has upon the malignancy of the tonsil.

DR. HERMAN B. COHEN: I am inclined to believe with the last two speakers that the tumor is benign in character. From my experience if this were malignant, the involvement would be more lateral. There would be a tendency to ulceration by this time and there would be a reddish-pink color mass, whose form were changing.

I would like to ask Dr. Butler if the patient complained of pain referred to the ear or defective hearing on that side. In this patient, the glands are just palpable, equally so, on both sides; this gives no clue. I would say that this is a benign tumor; first, probably a lipoma; secondly, a fibroma.

DR. BUTLER, closing discussion: The patient had no pain whatever except some soreness following the radium treatments. Since there was so little pain and no involvement of the cervical glands, and since the tumor showed no evidences of ulceration or sloughing and seemed to remain about the same in size, my feeling has been that it was benign.

Pharyngeal Oidiomycosis in an Adult; Case Report; and Presentation. Dr. M. A. Zachs.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. SIGMUND S. GREENBAUM: Babies' sore mouth, or thrush in an adult is, of course, an extremely rare condition, and is interesting because of this rarity. When one makes smears or a dark field examination of debris at gum margins, particularly in unclean mouths, one finds a number of organisms in the form of threads or filaments which have been grouped more or less in the textbooks as cladothrix, leptothrix and streptothrix, depending upon the presence or absence of branching, both true and false. These are normal mouth saprophytes. It is possible that under suitable conditions they assume a different form when living as parasites. In recent years, an attempt has been made to classify these organisms, as yet without unanimity of opinion. The group mentioned by Dr. Zachs has been classified under the name of fungi imperfecti, the grouping being based largely upon the difficulty in identifying the variations in the fructifying forms, but the thing you will be particularly interested in will be concerning certain experiments with these monilia or oidia.

Several years ago, in attempting to grow these organisms on alkaline solid media, it was observed that the growths either did not develop, or were considerably dwarfed. This would appear to indicate, from a practical standpoint, the desirability of using alkalis in the treatment of patients infected with this parasite. In this connection, it should be remembered that the infection is extremely superficial, with but slight extension by the parasites to the papillary vessels of the submucosa, explaining the bleeding when the mycelial mass is removed forcibly.

In a recent study of yeasts and yeast-like organisms of the monilia and oidia type in the intestinal feces, I was surprised that we were able to recover these organisms in fully 60 per cent of individuals supposedly normal, so that the finding of the organisms described by Dr. Zachs in his patients' feces does not necessarily indicate extension of the infection to the intestines unless there were definite symptoms pointing to it. I feel that in view of the fact that a definite status for these fungi is still undetermined, the term, pharyngomycosis, would clearly indicate the condition.

DR. WM. G. SHEMELEY, JR.: I should like to mention a form of treatment in this condition first pointed out to me by Dr. Mackenzie. Dr. Mackenzie advocates, first, cocaineizing the area of the lesions and then applying monopolar fulguration to each spot. Of course this requires several treatments, but in the twenty patients observed, it has proven very satisfactory. Some of the cases have cleared up quickly, but of course this depended upon how extensive the disease was. One of the worst cases was that of a dentist in Cape May, who

required about one or two treatments a week for a period of about two months.

DR. HARRY A. SCHATZ: The description of the symptomatology of the cases sounded a great deal like mycosis of the pharynx and lingual tonsil, yet the bacteriology seemed to point entirely toward a different kind of organism. Without the bacteriologic contradiction I would think the case was streptothrix or mycotic condition of the throat. I have used the electric cautery in some cases and it seems to be very effective where chemical agents had failed.

DR. PHILIP S. STOUT: In babies with thrush, I think it is rather severe treatment to use cautery. A combination of resorsin, borate of soda, alcohol, glycerin and water applied every two hours is usually sufficient to check the condition. I have never known this to fail in adults who have the same condition, no matter how chronic it may be.

DR. DOUGLAS MACFARLAN: I should like to ask Dr. Zacks where he found his literature on the subject. Most modern textbooks do not have a thing about thrush nor the fungi. Burnett's work devotes a whole chapter to the varieties of fungi associated with the ear; but the classification used by the sources cited is most confusing.

Two years ago I presented before this Society a case of "nigricans" of the tongue; a white plush-like coat on the surface turned black every two weeks when the fungus sporulated. The treatment was very discouraging until silver nitrate was precipitated in the hyphae with tannic acid. A second case of the same type has been reported.

DR. HERMAN B. COHEN: Prior to 1917 I was interested in the subject and spent a few months looking up the matter and prepared a thesis, which was later published in THE LARYNGOSCOPE. This case looks like one of pharyngomycosis from the description.

I have treated a number of cases of this nature with the electric cautery, and I might mention that Dr. Mackenzie had suggested the use of the cautery to me in those days. I have recently operated upon such a case, having removed the tonsils and treated the remaining affected lymphatic nodules with the electro-cautery.

DR. M. A. ZACKS: In answer to Dr. Macfarlan's question, I, too, experienced considerable difficulty in finding data in the literature regarding this condition. Oral idiomycosis, as a disease of children, is mentioned repeatedly, but its occurrence in adults is practically unmentioned in textbooks dealing with this condition.

The cautery method came under consideration and inasmuch as it is the common belief that the condition does not occur on a normal mucous membrane and is not limited to the mucosa, but buries itself into the submucosa, any element causing lowered local tissue resistance might cause a spread, this procedure was not deemed advisable. Also, since the patient was practically symptomless during this treatment and since there was never any tendency on the part of the lesions to spread, we felt that we could disregard, for the time being at least, any procedure or method which might react locally, lower tissue resistance and encourage spread. It would have been an endless and difficult task to have cauterized all the separate lesions which were studded over the lateral pharyngeal folds on both sides, as well as the site of the lingual tonsil. There is probably little doubt that this condition is not so rare as the absence of literature dealing with this subject would indicate, and while there was little thought in mind to point out a new or rare condition, a plea is made for proper smear and culture methods for the diagnostic determination of all chronic, resistant, membranous conditions of the pharynx.

Report of a Case of Influenza Simulating Sinus Thrombosis. Dr. Louis Baer.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. G. W. MACKENZIE: Sinus thrombosis is perhaps the least well understood of any of the conditions with which the otologist has to deal. I recall that about three years ago at a Triological Society meeting in Atlantic City, Dr. Frazer, of Scotland, when he was the guest of the Society, claimed that

the last five cases of lateral sinus thrombosis he had, recovered without operation. Dr. Day, of Pittsburgh, arose to say that he had a similar experience. Fearing that the younger men might be encouraged to neglect the out operative cases, I arose to point out the dangers.

The bacterial toxins in the case of middle ear and mastoid suppuration finding their way through the sinus wall can produce the characteristic temperature of thrombophlebitis without the presence of a septic clot. Again, there are several kinds of thrombi, the so-called mural, the obturating and the canalized. Again, a thrombus may be the so-called red one, which has not yet been infected, or it may be yellowish, suppurating one, or white and organized. Thus it is explainable that one could with perfect frankness state that he has witnessed a series of cases of thrombi recovery without operation; and, perhaps the very next case he meets and does not operate may die from a blood stream infection, because the thrombus happened to be a suppurating kind. In the case of a patient presenting the characteristic temperature found in thrombophlebitis, it is well to at least expose the sinus at the time the mastoid is operated and inspect and even palpate it. In the case of thrombophlebitis granulations are frequently observed on the surface (perisinus abscess); at the same time the lumen of the sinus need not be involved. On the other hand, it is possible for a sinus to be thrombosed in the absence of a perisinus thrombosis.

In any event, finger palpation of the sinus, gently made, in order not to dislodge the sinus, will reveal a certain boggyiness in the presence of a thrombosis that is not present in the case of the normally patulous sinus. In the case of doubt it is well also to make Tobey's test of the increase of cerebrospinal fluid pressure from compression on the vessels in the neck on the side opposite the thrombosis. There is need also of a blood count and blood culture in the case of suspected thrombosis.

DR. B. H. SHUSTER: This is a very interesting case, but I disagree with the conclusions of the writer. I believe this case to have been one of sinus thrombosis and, fortunately, recovered without surgical intervention. There are such cases reported as has been mentioned by Dr. Mackenzie. It may have been a case of sinus phlebitis without clot formation, a condition which could very likely get well without operation.

There are several things about this case that are worthy of discussion. First, the blood picture, a leucocytosis of 22,000 does not speak for influenza, and the fact that later it came down to 14,000 does not alter its significance. It probably indicates the waning of the patient's resistance. In a case I had recently, the leucocyte count gradually came down from 20,000 to about 6,000, at which time we found pus in the sinus at operation.

In the report of the blood count not a word was mentioned about the red cell count and the percentage of hemoglobin. These are probably more diagnostic than the white count. Kopetsky has shown that most cases of sinus thrombosis are caused by the streptococcus hemolyticus, and because of that, the infection tends to destroy the hemoglobin element in the blood and we expect to find a gradually diminishing hemoglobin and red cell count to indicate this blood stream infection.

The statement made that at operation upon the mastoid the sinus plate was found to be normal is worthy of note, because we must bear in mind that not only the plate but even the sinus itself may have a normal appearance and so fail to betray an infection within. Frequently the sinus is infected through a thrombophlebitis of the small vessels in the mastoid, which infection is carried into the sinus without effecting necrosis of bone, so that a normal-looking sinus is not always a reliable guide and other clinical data must be taken into consideration.

My experience with the Ayer-Tobey test in several cases has not been entirely satisfactory. In my case I just mentioned, this test was absolutely negative about a week before I opened the sinus and found liquid pus. In other words, at the time when it is reasonable to assume that there was a complete thrombus before disintegration, it failed to give a positive indication.

DR. L. BAER: When the mastoid operation was performed and the sinus plate was exposed, there was no indication for exploration of the lateral sinus.

The temperature of 103° was due either to mastoiditis, or to the measles. The leucocytosis of 22,000 was before the mastoid operation was performed, from which the patient recovered. Had no temperature for fifteen days and went to school for three days. At the second sickness he had a leucocytosis of only 14,000. We all meet cases of sinus thrombosis with spontaneous recovery. Many are reported in the literature, as I made mention in my paper. But those cases that recovered without operation are usually of mild character. Our case ran a very severe septic temperature for seven days, which if it were due to sinus thrombosis, the patient would not have recovered without operation, and in the absence of other signs, I am inclined to believe that it was a case of influenza.

Basilar Fracture, with Seventh and Eighth Nerve Involvement. Report of a Case. Dr. Wm. G. Shemeley, Jr.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. B. H. SHUSTER: I would like to mention a case of mine which was similar to that of Dr. Shemeley's. This was a case in which I diagnosed a fracture at the base of the skull from clinical data. The patient had fallen into a ditch and when his acute illness as a result of the fall passed, the patient was found to be blind. In search for a fracture, the patient was most thoroughly X-rayed, but no evidence of the fracture could be found. Because of some deafness he was referred to our dispensary in the service of Dr. Coates for an examination. I found a nerve deafness, a facial paralysis, and the Barany tests indicated a nonresponsive labyrinth. I then took it to be an injury in the region of the internal auditory meatus and requested an X-ray of the mastoid process, which included the petrous portion of the temporal bone. This picture revealed a linear fracture in the petrous portion of the temporal bone.

DR. G. W. MACKENZIE: In the case of fracture of the skull, with surface communication, in other words, compound fractures, there is usually some bleeding. In the case of a crack in the skull, the blood contains no cerebrospinal fluid and tends to stop readily; whereas, in the case of comminuted fracture with overriding edges, the dura is lacerated and the flow of blood is mixed with cerebrospinal fluid and tends to last for hours, if not days. In a case of this latter kind there is need for early operation, since the danger of complicating meningitis is very great. Dr. Shemeley's paper dealt mostly with the localization of fractures, which tells you where you should operate in case operation is indicated; I am merely adding the indications for operations.

DR. GEO. M. DORRANCE: We no longer speak of head injuries in terms of fracture. We regard these conditions as to the amount of damage done to the brain and contents of the skull. Cases are sent back from the X-ray with reports of linear fracture. This in itself means nothing. It is the damage done to the brain tissue and the compression on the brain substance upon which the treatment depends.

DR. PHILIP S. STOUT: Fracture at the base of the skull, involving the petrous portion of the temporal bone. I have seen two such cases and in both instances the fracture was followed by an infection that came from the middle ear. At the autopsy you could see how the infection spread from the crack in the bone down to and around the lower part of the brain, causing basilar meningitis. One lived about ten days, and the other about fourteen days.

DR. SHEMELEY, JR., closing discussion: I thought that someone would be interested in the possibility that, since this patient had some infected teeth and bad tonsils, she might have had a focal infection of the seventh nerve on the left side with a coincidental fall. Suppose such a thing might have existed and occurred, it would not explain all the symptoms; especially the presence of blood in the middle ear cavity on the left side and the diminished after-turning nystagmus on the left side.

Dr. Stout spoke of the impossibility or nonprobability of preventing the development of meningeal symptoms in the basilar fracture cases.

There were many cases of basilar fracture in both the Allied and German armies. Early in the war the surgeons of the Allied armies lost the greater proportion of their cases because they infected their patients through their

efforts at local treatment. On the other hand, the German army surgeons had been taught the danger of any attempt at local treatment in basilar fractures. Their treatment was largely expectant and a large percentage of their cases recovered. They operated these cases where there was evidence of an overriding of the edges of the fracture and a torn dura.

An Exhibition of the Aids to Hearing, Submitted for National Survey.
Dr. Douglas Macfarlan.

The occasion is taken to show the types of instruments offered and used by the hard-of-hearing. As there are about 90 of these on the market, it is obviously impractical to demonstrate them all.

Everyone is familiar with the nonelectrical types—horns, tubes and conchs. These early instruments are still the most useful for mild deafness, for they do not distort, most of the deafened object to their being conspicuous.

Following these hearing aids there came the telephone types, with greater speech amplification, small working distance and much distortion in the pitch characteristic of the diaphragm. Some deafened become accustomed to this distortion and can interpret what speech they hear in spite of it. Others cannot. No two diaphragms are alike, even with the same type of instrument; so a change of instrument means a new distortion.

With the advent of the radio and its audion tube, audion amplification was used; intensities were greater, but still distortion was marked, and the weight of the instrument was greatly increased.

Midget ear receivers have lately appeared. They are of course welcome on account of their inconspicuousness, but they are very disappointing except to the mildly deafened.

Lastly, there is shown an amplifying set using a choke coil, a microphone and a receiver. A switch on the coil allows the user to change from telephonic speech to phonographic speech, for a phonograph with an electric tone arm is used in connection with the machine. The apparatus offers promise of much progress in instructing the deaf child. At one of the local schools the hearing of 45 out of 50 children can be reached by this method. There is found a residuum of hearing in more of these cases than was suspected, and the machine can reach those who have a 15 per cent hearing remnant (audiometric measurement).

With the microphone the children can hear their own voices; this is a distinct aid in speech correction. Speech faults and a false voice are always present in these cases.

The instruction time and the tediousness of deaf-teaching should be greatly reduced.

At present there are a few schools using audion tube amplifying sets. The tubes add to the expense, cumbersomeness and frailty of the machine.

For the phonograph, there are on the market a number of electric tone arms, varying considerably in performance.

The survey of these instruments concerned in the relief of deafness is an activity of the Federation of Societies of the Deafened. Already a physical survey has been made by the Bureau of Standards; this is followed by a clinical survey now in progress.

DISCUSSION.

DR. G. W. MACKENZIE: The subject of hearing aids is a very important one, if for no other reason than that it helps to keep the end organ stimulated, which under less favorable conditions is not done. In all cases of deafness, from no matter what cause, after a while the hearing tends to depreciate still more, because of secondary blunting of the acuity of hearing which follows where the end organ fails to receive that stimulation which all normal hearing people experience. The same is true of the eye. The ophthalmologist is familiar with the condition known as amblyopia exanopsia, which calls for visual exercises of the squinting eye, the one not used by the patient. Most of you can recall how many people claimed improvement of hearing following the listening in of the so-called radio outfits.

DR. PHILIP S. STOUT: We hope to get up instruments even smaller than those which Dr. Macfarlan has shown. They are either objectionable because

they are unsightly or they hear too many noises. I am glad that Dr. Macfarlan has taken up these instruments in Philadelphia, because we are having more and more deafness.

The constant noise and din to which the children and young folks are constantly exposed has something to do with the deafness that is so common at the present time. It is rather startling the number of young men and women who are found on examination at their entrance to college to have impaired hearing.

Dr. MACFARLAN, in closing: Dr. Stout read a very good paper at the State Society, covering the annual examination of freshman students at the University of Pennsylvania. The national survey of the public schools will be released this year. It is being done very carefully and will determine the exact cost of deafness to the community. The number of deaf children is appalling and is a handicap to the educator. Our best available data tells us that 3,000,000 children are repeating school work on account of deafness. The cost of educating a deaf child is about \$1400 to \$1600 a year. That is an astounding amount and it is four times as much as the average education of a child.

Dr. Zacks asked me what type of deafness is helped by artificial aids to hearing. This depends upon the degree of deafness rather than the type. All types of deafness of mild degree, except the perceptive types, should use hearing aids, and should immediately take up lip-reading.

In handling your patients you must get them used to their affliction and make them feel that they are not conspicuous. I say this, because in relieving them of their self-consciousness you are correcting one of the greatest miseries of the deafened. We may not be able to increase the hearing, but we must rehabilitate these cases, not leave them to their own resources.

Meeting of March 1, 1927.

COLLEGE OF PHYSICIANS.

1. **Presentation of New Instruments.**
"A Device for Improving the View in the Ear." Dr. Reuben Herbert Breslin.
(To appear in a subsequent issue of THE LARYNGOSCOPE.)
2. **"Intracranial Complications of Otitic Origin, with Reference to Diagnosis and Management."** Presentation of a Case of Cerebellar Abscess. Presentation of a Case of Sinus Thrombosis. Dr. Benjamin H. Shuster.
(To appear in a subsequent issue of THE LARYNGOSCOPE.)
3. **Case Report: Temporosphenoidal Lobe Abscess Recovery.** Case Report: Sinus Thrombosis Recovery. Dr. Matthew S. Ersner.
4. **Case Report: Temporosphenoidal Abscess.** Dr. M. Valentine Miller.
5. **Discussion:** Dr. George M. Coates, Dr. J. C. Yaskin (by invitation), Dr. George W. Mackenzie.

DISCUSSION.

Dr. GEORGE M. COATES: Dr. Coates complimented Dr. Shuster on his very admirable paper and stated that inasmuch as he did not wish the "Coates Clinic" to take up the entire evening, he would make his remarks rather brief.

Dr. Coates said that the diagnosis of intracranial complications was not easy. The symptoms were usually indefinite and atypical in the early stages. Later on, when the disease had advanced and the symptoms assumed more of a textbook form, the diagnosis was simple, but often it was then too late for therapeutic measures. Of course it was essential that the diagnosis be made early and therefore we should avail ourselves of the co-operation and help of all the other branches of medicine, particularly the neurologist. Dr. Coates agreed with Dr. Shuster that the neurologist should work hand in hand with the otologist and get the otological viewpoint. When a mastoidectomy was performed and the patient did not do so well, we naturally thought of intracranial

complications because that was what we feared most. The physical condition of other parts of the body should also be considered because the internist in his examination might discover a pneumonia or other medical affection. However, we must not trust to the internist's opinions exclusively, as sometimes the case might be sinus thrombosis, intracranial abscess or meningitis and not a medical condition and so the proper treatment might be delayed.

Dr. Coates stated that even in meningitis if the diagnosis was made early enough there was an opportunity of helping the patient. Exposing and draining the dura in a localized case would sometimes bring about a cure.

With reference to ocular palsies he emphasized that they were of distinct help in localizing our infection. For instance, in the Gradenigo syndrome the sixth nerve was involved, with a resultant external rectus paralysis. This was usually due to a localized meningitis near the petrous tip of the temporal bone, but it might also occur as part of an involvement by a brain abscess.

Dr. Coates mentioned that in the treatment of brain abscess often mere opening of the abscess was not sufficient to cure the case, for there might be multiple abscesses which had not been diagnosed. Tapping of one would improve the patient for a while only. In draining brain abscesses the more gently one treated the tissues the more successful one would be. The abscess should be evacuated carefully and slowly. An area of encephalitis always surrounded the abscess and if precaution were not used the infection would readily extend. Sometimes the walls of the abscess might collapse and so interfere with proper drainage.

DR. GEORGE W. MACKENZIE: Dr. Coates and his entire staff deserve the thanks of the Society for what I believe is the best symposium we have listened to. The subject of intracranial complication of otitic origin is always interesting and I would like to discuss it freely, but the hour is too late. One of the difficulties we have in the diagnosis of intracranial conditions is the fact, as pointed out by MacEwen, that these complications very rarely occur singly.

Crassed or alternate hemiplegia, that is, involvement of the face on one side and of the extremities on the opposite side, is not uncommon. But when the involvement of the facial muscles are contralateral and the involvement of the extremities homolateral, the condition must be rare and is explainable, according to MacEwen, on the basis of a pressure of the medulla against the opposite rim of the foramen magnum. In other words, it is a truly distant working symptom.

Eagletons' name was mentioned several times this evening while discussing the intracranial complications of otitic origin. Those of you who have listened to Eagleton or read his book on Brain Abscess will recall that he cites many cases of cerebellar abscess from the literature. In some of the cases the nystagmus is directed toward the opposite side, in others it is directed toward the same side, while in still others there is no nystagmus at all. In cerebellar abscess it is well to observe carefully the behavior of the nystagmus over some period of time, where it is possible. In most cases it will be observed that the nystagmus is more horizontal than that usually found in labyrinthine disease. Again, there is less vertigo associated than in the case of labyrinthine disease. Furthermore, there is not the definite direction to the falling reactions, as found in labyrinthine disease. There is a tendency to fall, but always to the hypotonic side, which is on the same side of the cerebellar destruction. In cerebellar abscess during the stage of congestion (irritative stage) the nystagmus is directed toward the side of the lesion; during the destructive stage it is away from the lesion. It is possible to find a patient manifesting no nystagmus for a brief period when the abscess has so well developed that the cerebellum is compressed against the skull on the opposite side, when the patient will manifest symptoms of bilateral destruction.

In meningitis the nystagmus is constantly changing, so far as the plane of the movement and the direction of the quicker component is concerned.

DR. MATTHEW S. ERSNER: Dr. Ersner reported ten cases of otitic complications, illustrated with lantern slides, namely, two Gradenigo cases, two temporal sphenoidal abscesses, two cases of pachy meningitis (localized), and four cases of sinus thrombosis.

Gradenigo cases (2): In describing the two Gradenigo cases, the first was a child age $2\frac{1}{2}$ years, who developed an acute otitis media, temperature 104.2° , profuse aural discharge and an abducent paralysis. It was the latter symptom that alarmed the parents. A simple mastoid operation was performed and within four days all the symptoms subsided.

The second case of Gradenigo was a child, age 10 years. Five weeks prior to the present illness a simple mastoid was performed. The present illness began suddenly, with severe headaches, nausea, vomiting and temperature of 104.2° F. Upon examination several hours after the onset we found the mastoid wound and middle ear dry. The only symptoms elicited were the headaches, nausea, vomiting, temperature and pain in the eye on the side that the operation was performed. A cathartic and enema was administered, but the symptoms did not subside. The patient became progressively worse. The headache was most excruciating, the pain in the eye was persistent, and patient complained of photophobia. At this time it was decided to hospitalize the patient. The above symptoms still persisted, but we found a septic temperature, which was suggestive of a sinus thrombosis. There was also a rigidity of the neck with a positive Kernig, tenderness over the sternocleidomastoid along the course of the internal jugular vein, paresis of the sixth nerve, papillitis, choked disc, dysergia of the left leg. In view of the alarming symptoms, it was thought best to operate. Operative findings: Exposure of the lateral sinus was negative. Exposure of the dura over Trotman's triangle was negative. However, upon removal of the cerebral dural plate there was an escape of a thin serous fluid. The patient made an uneventful recovery. Within two weeks the patient was discharged from the hospital.

Conclusion: 1. The temperature in both instances gave us the impression that the cases were sinus thrombosis. 2. Both mastoids were of the large cellular type; coalescent; the extension of the cells were diffused and in all directions. 3. At operation in both cases, the cerebral and cerebellar dura were exposed, also the lateral sinus. In one patient the findings were negative, while in the other there was an escape of serous fluid from the middle fossa.

Temporal sphenoidal abscesses (2): The first case was a little girl, age 12 years, who at various times had a recurrent otitis media, and often complained of headaches. After refraction the headaches improved. The present history began with influenza and spontaneous rupture of the left eardrum. The acute symptoms subsided temporarily and after several days the pain in the ear over the mastoid fulminated and at this time we found an acute suppurative otitis media, with profuse aural discharge. She also had pain over the mastoid, severe headache, which could not be controlled by opiates. After several days of study we found slight paresis over the right side of the face, photophobia, diplopia and severe headaches. X-ray examination revealed the large cellular mastoid type, although there was some sclerosis, probably the result of previous suppurative otitis media. The temperature at this time was fluctuating between 99° and 101° . A simple mastoid was performed, after which the symptoms subsided for about one week. At this time there was a recurrence of the headache, diplopia, photophobia and an external rectus palsy. It was at this time that the meningeal irritations appeared, which was characterized by the constant crying and irritability. The temperature became subnormal and the pulse rate ranged between 60 and 70. Eye examination at various times revealed a papillitis with a rapidly approaching choked disc. It was interesting to note that although this was a left-sided lesion, still there was no interference of speech nor was there at any time any severe mental disturbances. There were no Jacksonian convulsions and at no time did we find any cupping in the visual field. The spinal fluid revealed 20 to 50 cells, otherwise the findings were negative. In one instance the resident physician withdrew 20 c.c. instead of 2 to 5 c.c. At this time the patient improved for twelve days, after which the symptoms again reappeared and it was deemed advisable to explore the operative field. The blood picture was that of secondary anemia. Operative findings: Left temporal sphenoidal abscess was evacuated and 2 ounces of pus was drained at the time of operation. Postoperative treatment consisted of a small rubber tube with gauze packing and frequent irrigations with Dakin's solution. Patient made an uneventful recovery.

(To be continued)

